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# USSR Report

## AGRICULTURE

No. 1281

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# IMPORTANCE OF GENETICS, FEED, TECHNOLOGY TO ANIMAL HUSBANDRY DEVELOPMENT

Moscow EKONOMIKA SEL'SKOGO KHOZYAYSTVA in Russian No 4, Apr 81 pp 30-35

[Article by L. Ernst, vice President of All-Union Academy of Agricultural Sciences imeni V.I. Lenin: "Problems and Factors Associated With Development of Animal Husbandry"]

[Text] In "The Principal Trends For the Economic and Social Development of the USSR During the 1981-1985 Period and For the Period Up To 1990," tasks were established for further increasing the production and improving the quality of animal husbandry products, for the intensification and industrialization of its branches, for strengthening the feed base and raising the efficiency of selection-breeding work and for achieving a considerable increase in the output of products per head of livestock.

Within the country there are rather large numbers of the principal types of agricultural animals and poultry and objective conditions are available for sharply increasing the production of feed. However, it bears mentioning that by no means is full use being made of these conditions.

For both the immediate and more remote future, the rates of development for and improvements in the efficiency of animal husbandry will be determined by the following factors: the rates for genetic improvements in the populations of agricultural animals, an increase in the level and an improvement in the quality of their feeding, optimization of the use and also the development and successful introduction of highly efficient technologies for carrying out production operations on an industrial basis. Only integrated and complex interaction of all of these factors will make it possible to accelerate the development of the branch on the whole.

## Genetic Improvements in the Animals -- The Foundation For the Intensification of Animal Husbandry.

Our country inherited an extensive and low productivity animal husbandry branch from Czarist Russia. Non-pedigree animals constituted the basic stock for all types of agricultural animals. The low genetic potential of their productivity tended to hold back further development of the branch.

In 1918, based upon the initiative of V.I. Lenin, the decree entitled "Pedigree Animal Husbandry" was adopted. This decree ensured the preservation of valuable genetic resources and it laid the foundation for breeding work being carried out throughout the country.

As a result of planned and purposeful selection-breeding work, tens of new domestic strains of animals were introduced into operations and the breeding qualities of existing strains improved. This created the conditions required for increasing the production of animal husbandry products and improving their quality.

It is sufficient to state that, compared to 1913, meat production (in dressed weight) increased from 5 to 15.5 million tons, milk -- from 29.4 to 93.3 million tons, eggs -- from 11.9 to 65.6 billion units and wool -- from 192,000 to 472,000 tons.

However, at the present time, with the branch being assigned great tasks associated with further intensification and converting over to an industrial technology, the average genetic potential productivity achieved for the animals no longer conforms to the new and raised requirements.

The scientific institutes in our country and abroad have developed effective systems for implementing genetic improvements in the strains of agricultural animals. Thus, in dairy cattle husbandry, based upon the complex use of modern genetic methods, the biology of reproduction, mathematical methods and electronic computers, a system was developed for large-scale selection, the introduction of which makes it possible to propagate the offspring of more valuable specimens, accelerate the processes of genetic improvements in large groups of agricultural animals and utilize both domestic and international genetic resources in a more effective manner. The development of artificial insemination methods, the discovery by Soviet scientists of the phenomenon of preservation of the viability of gametes at the temperature of liquid nitrogen and the development on this basis of a method for the extended storage of gamete producers made it possible to realize an improvement in quality throughout the entire system of selection-breeding work and it opened up unprecedented opportunities for accelerating the selection processes and for rapidly creating strains, types and lines of animals which combine a high potential productivity with the capability to achieve it under the conditions imposed by a modern industrial technology.

Basically new information systems ensure the operational collection, storage, processing and analysis of data on the productivity and other breeding characteristics of hundreds of thousands and millions of animals and this makes it possible to control the selection-breeding processes for entire strains in various regions of the country. However, the realization of these favorable opportunities is still not being carried out at a high tempo and this is restraining the scale of improvements in the livestock.

It is generally known that modern breeding methods cannot be realized if artificial insemination is not employed. Unfortunately, in the nonchernozem zone of the RSFSR, our method of artificial insemination is being used for only 68 percent of the animals. At artificial insemination stations, the sperm from one bull is inseminated in just slightly more than 1,000 cows annually, with the degree of use of sires increasing only negligibly during the five-year plan. In the northwestern region alone, 75 percent of the brood stock is inseminated artificially, in the central region -- 59 percent and in Volgo-Vyatskiy Rayon -- 53 percent. In 10 oblasts of the zone, artificial insemination is used on less than 10 percent of the animals.

And this means that the most effective breeding methods cannot be employed for more than one half of the animals. In Bryanskaya, Vladimirskaya, Kalininskaya, Orlovskaya, Ryazanskaya, Kirovskaya and a number of other oblasts in the zone, more than 20 percent of the animals being presented are hybrids.

A most important factor with regard to raising the efficiency of selection-breeding work is the extensive introduction of genetic evaluations of sires in terms of the quality of their offspring. Accurate methods for conducting such evaluations have been developed by science. They have been checked in actual practice and confirmed by their high effectiveness. The extensive use of super-cooled sperm obtained from improvement-sires will make it possible, within a brief interval of time, to raise the productivity of many animals. Thus the use of just one improvement-bull, within a large-scale system of breeding, ensures an increase in the milk productivity of the offspring of from 2,000 to 5,000 tons, all other conditions being equal.

At the same time, it bears mentioning that the potential of this system is still not being employed fully. Sire-bulls which have been checked according to their offspring constitute approximately 10 percent of the number of sires located at artificial insemination stations. True, a genetic reserve of sperm obtained from improvement-bulls has been created during the past few years. At the present time, 13.4 percent of the sperm reserve available at artificial insemination stations in the RSFSR was obtained from genetically checked animals. More than 9,000 sires are in the process of being checked. Approximately 11,000 dosages of sperm, obtained from each one of them, have been placed in extended storage. During the next few years, this stockpile will serve to accelerate the processes for obtaining quality improvements in the livestock. But some mention should be made regarding the need for more rational use of already existing genetic reserves.

Thus, at farms in Leningrad and Moscow Oblasts, the Lithuanian SSR and the Estonian SSR, where the genetic potential for dairy cattle productivity exceeds considerably the average level for the country, a surplus supply of sperm from the more valuable bulls has been accumulated -- 7.8 million dosages, 6.8 million, 17.9 million and 8.2 million dosages respectively. In other zones of the country, use is being made of sperm obtained from bulls of lower quality, thus establishing an insufficiently high genetic potential for productivity for many years into the future. Thus a need will exist in the near future for thoroughly solving the problem concerned with utilizing the surplus genetic reserves in those zones where high productivity livestock are being bred.

It is becoming more and more obvious that the use of super-cooled semen is a most important factor for achieving efficient breeding operations. In this regard, more extensive use should be made of the system of transporting gametes to various regions and oblasts throughout the country, with the work being carried out under the direction of the breeding centers. Consideration must be given to the fact that use of the artificial insemination method requires minimal expenditures of material and financial resources in order to increase the production of animal husbandry products.

However, even with use being made of highly valuable bulls, specimens marked by extremely low productivities are still appearing in the populations. Thus greater attention must be given to breeding that is based upon evaluation and selection of first heifers according to actual productivity, a productivity which makes it possible to eliminate minus-variants when the heifers are very young.

All of the above-mentioned problems apply at the present time, to a greater degree, to the sphere of introduction into operations: workers attached to breeding services, jointly with the collectives of animal husbandry breeding centers, must play the principal role in solving these problems.

On the whole, it can be stated that the genetic potential that has already been created for the productivity of dairy cattle is making it possible, on many farms and assuming the creation of favorable conditions for feeding, maintenance and operations, to achieve an annual milk yield level during the next few years of 3,000-3,500 kilograms per cow and in a number of oblasts -- 4,000-4,500 kilograms.

For our country, which is characterized by many strains of cattle, an important problem continues to be that of optimization of the pedigree structure.

A comparative evaluation of strains is being carried out on the basis of accurate experiments and an analysis of a mass of data. Substantial and reliable differences in the productivity of regionalized strains were disclosed.

Thus the average milk yield for a cow of the black-variegated strain on farms in the RSFSR was 17.6 percent higher than that for the Shvitskaya strain, 20.6 percent higher than the yield for a cow of the Red Steppe strain and 27.4 percent higher than the Simmental'skaya strain.

The task of optimization of the strain structure through a more rapid dissemination of the more productive strains is extremely urgent. Work has been going forward in this direction for a number of years in our country and definite successes have been achieved. Over the past 20 years, the proportion of the Black-Variegated strain among the large-horned cattle strains increased from 11.7 to 22.6 percent. At the present time, with tremendous genetic reserves having been created in the storehouses, all of the conditions are available for optimization of the pedigree structure for long-horned cattle.

More active work must be carried out in connection with utilizing international genetic resources. The above-mentioned evaluations, principles and peculiarities of breeding work carried forward in dairy cattle husbandry are also, to a considerable degree, typical of other branches of animal husbandry, obviously with their specific characteristics being taken into account. Breeding centers associated with research laboratories of institutes and the breeding service will facilitate the rapid assimilation of the results of studies into practical breeding work.

Thus, all of the prerequisites are available in the country for raising the genetic potential and for creating new types of agricultural animals capable of providing high productivity under the conditions of a modern industrial technology.

## Improvements in Feeding -- A Principal Condition For Realizing the Genetic Potential of Large-Horned Cattle.

Despite a number of substantial shortcomings in selection-breeding operations, large numbers of cattle have been created throughout the country having a relatively high potential for productivity. The animals of a majority of the dairy cattle strains bred are capable of producing an annual milk yield of 3,000-3,500 kilograms and individual strains -- 4,000-4,500 kilograms. The average daily increase in live weight for young large-horned cattle stock can be raised to 900-1,000 grams and swine -- to 550-650 grams.

Nevertheless, in many instances, owing to a low level of feeding, unbalanced rations and low quality feed, the actual productivity of the cows is on the order of 2,300-2,400 kilograms of milk annually and the average daily increase in young large-horned cattle stock -- 400 grams and swine -- 300-350 grams. Obviously, the reasons for this are very diverse. But, without a doubt, one of the chief reasons is shortcomings in the feeding of the animals.

The feeding problem must be examined from two aspects: the feeding of ruminant animals (large-horned cattle and sheep) and single-stomach animals (swine and poultry).

First of all, mention should be made of the inadequate overall level of feeding for large-horned cattle and sheep. Growth in the production of feed is lagging behind growth in the number of animals and the speed with which the genetic productive potential of the animals is increasing. Moreover, the structure of the ration for the large-horned cattle does not fully conform to their physiological requirements, the feed being supplied to the animals is not adequately balanced and the ration for cows lacks high quality coarse and succulent feed.

Analysis has revealed that both for the RSFSR as a whole and for the nonchernozem zone, the rates for growth in the production of the principal feed used for large-horned cattle are not very high. Thus, whereas the average annual gross yield of grain in the zone during the Tenth Five-Year Plan increased by 24 percent above that for the Ninth Five-Year Plan, silage crops -- by 21 percent and corn for silage and green feed -- by 5 percent, the production of perennial grass hay decreased by 7 percent and annual grass hay -- by 35 percent.

Over the past 10-12 years, a trend has been observed towards increasing the consumption of concentrated green feed in cattle husbandry. For example, whereas the overall consumption of feed per quintal of increase in live weight increased from 10.6 to 12.4 quintals of feed units (by 14 percent), the consumption of concentrates -- increased from 1.3 to 3.3 quintals of feed units (by a factor of 2.5). For 1 quintal of milk, it amounted to 0.4 quintals of feed units, at complexes -- 0.45 quintals and at a number of farms -- 0.5-0.6 quintals of feed units.

The high rates of increase in grain consumption, despite the fact that they exerted a certain influence on intensification of the production processes for milk and beef, cannot be compared to the rate of growth in grain expenditures.

It is sufficient to state that although the consumption of concentrates increased substantially, the average milk yield in 1978 was 4 percent lower than in 1975 and the average daily increase in live weight in young stock, on farms in the nonchernozem zone, remained at the level of 545 grams. All of this is associated with a slow rate of growth in the production of coarse, succulent and green feed -- the principal feeds in the ration for large-horned cattle -- and with their low quality.

A great amount of experience has been accumulated both in our country and abroad in achieving high dairy and meat productivity using a moderately concentrated type of feeding.

According to the data furnished by a number of foreign researchers and practical workers, it is possible to obtain an annual milk yield of 2,500-3,000 kilograms, without having to expend concentrates but using high quality succulent, coarse and green feeds.

In the near future, when the productivity of a majority of our cows is raised to the anticipated 3,000-3,500 kilograms of milk annually, it will be possible to recommend rations involving an expenditure of no more than 250-300 grams of concentrates per kilogram of milk. This will obviously require persistent and purposeful work aimed at sharply increasing the volume of production, expanding the variety and improving substantially the quality of the coarse and succulent feeds. The fulfillment of this program will make it possible to increase the production of cattle and sheep husbandry products, while realizing a considerable savings in the use of grain.

On farms in the nonchernozem zone, assuming the level achieved in the feeding of cows, which equalled roughly 34 quintals of feed units and upon the condition of an optimum structure for a ration and its proper balance and taking into account the genetic potential productivity already created, it is possible to expect a milk yield on the order of 2,800 kilograms. However, during the past 4 years of the five-year plan it actually amounted to an average of 2,457 kilograms of milk per cow annually.

Experience has shown that during the Tenth Five-Year Plan the norm for the consumption of hay (3.2 quintals per head of large-horned cattle) was clearly inadequate for satisfying the minimal requirements of the animals.

The decree of the CC CPSU and the USSR Council of Ministers entitled "Additional Measures For Increasing the Production of Coarse and Succulent Feed During 1980 and Raising Its Quality" calls for the solving of tasks concerned with implementing improvements in feed production processes and in the feeding of animals and accelerating growth in the production of the principal feeds for cattle and sheep husbandry -- the two largest branches of animal husbandry.

In solving these tasks, a very important role is played by the intensification of field feed production. At the same time, special attention is focused on the more rational use, in the future, of a vast natural wealth of our country -- its natural meadows and pastures.

In the nonchernozem zone of the RSFSR -- a zone of intensive dairy cattle husbandry -- the natural lands occupy 14.7 million hectares, including 6.8 million hectares of haying land. But the productivity of this land is low. An area of 3.7 million hectares is overgrown with undergrowth and light forestation. Only 14 percent of the haying land and 12 percent of the pasture land have been radically improved.

The carrying out of radical improvements in the natural lands will make it possible to strengthen the feed base of cattle and sheep husbandry and fully solve the problem of ensuring that the large-horned cattle and sheep are supplied with rich coarse feed.

The following technologies for procuring and storing feed are being employed at the present time and must be used extensively in the future: procurement of hay that has been pressed into bales or loose hay obtained from plant raw materials dry-cured in the field to a moisture content of 35-40 percent, with further drying carried out in barns using the method of forced ventilation; procurement of crushed haylage obtained from field-pressed plant raw materials having a moisture content of 50-60 percent, with placement in concrete trenches for preservation purposes; silage preparation using chemical preservatives, that will make it possible, under unstable weather conditions, to solve the problem of maximum preservation of the nutrients in the silage bulk. Moreover, a solution should be obtained for the problem of transporting the feed and the equipment used for applying the preservatives.

In the near future, attention must be given to the production of loose and briquetted cuttings and also vitamin grass meal in pure form and in a mixture with mineral components. These feeds make it possible to balance the rations of highly productive animals and especially young stock, with rich protein and vitamins.

One vital task of both the present and future is that of developing and introducing into operations effective methods for raising the nutritional value of straw, the production of which has now reached 200 million tons annually throughout the country. This represents a tremendous reserve of nutrients. A technology for the hydrobarothermal processing of straw, which makes it possible to improve the assimilability of this feed and enrich it with easily digestible carbohydrates, is being disseminated.

A lack of balance in the rations in terms of the principal nutrients is producing a situation wherein the consumption of feed for the production of milk on farms throughout the country remains high and equals 1.4-1.5 feed units per liter of milk. Mention should be made of the shortage of digestible protein in the feeds. Thus, on farms in the RSFSR and the nonchernozem zone, each feed unit contains only 90-105 grams of digestible protein. The level of protein nutrition must be raised by 20 percent in order to ensure further growth in the productivity of the cattle.

During the November (1979) Plenum of the CC CPSU, Comrade L.I. Brezhnev stated: "...Meat production is increasing very slowly. One of the reasons for this is a lack of balance in the feeds in terms of protein. There can be no doubt concerning the existence of this problem. But I am confident, considering the present level of our national economy and the present scales of expenditures for animal husbandry, that we can cope with this and other problems considerably more rapidly." [L.I. Brezhnev. Speech delivered before the Plenum of the Central Committee of the CPSU on 27 November 1979 -- Decree of the Plenum of the CC CPSU -- Moscow, Politizdat, 1979, p 17].

There are several methods available for solving this problem in cattle husbandry.

The chief sources for increasing the production of feed protein are an increase in the pulse crop acreage and improvements in their cropping power.

It bears mentioning that during 3 years of the Tenth Five-Year Plan the average annual production of pulse crops on farms in the RSFSR decreased by 19 percent, that is, the protein deficit increased and this necessarily had to bring about a reduction in the productivity of the animals, a deterioration in the quality of the milk and an increase in the specific consumption of feed.

An important and far from unused advantage of ruminant animals is their ability to synthesize protein in considerable amounts from non-protein nitrogen compounds (up to 30 percent of the overall requirement). The insufficient effectiveness of use of non-protein nitrogen at the present time is associated mainly with a shortage of easily digestible carbohydrates in the ration for large-horned cattle. Hence, the task of eliminating the deficit of easily digestible carbohydrates in the ration of large-horned cattle must be assigned to the scientific institutes as a most important state problem, which must be solved if a considerable increase is to be realized in the production of milk and beef.

Complex studies must be carried out aimed at creating a highly effective technology for the production of feed root crops, which will ensure a sharp improvement in labor productivity and a considerable reduction in output production costs. A requirement also exists for improving the technology for harvesting and storing feed, in the interest of ensuring maximum preservation of the easily digestible sugars in them. Special interest is being displayed in the development of methods for obtaining easily digestible sugars from complex carbohydrates.

The production of molasses through the hydrolysis of wood has been mastered on an industrial scale. Wood molasses, which can be used as a substitute for easily digestible carbohydrates in the rations for large-horned cattle, is already being obtained at a number of biochemical plants throughout the country. The plans call for its production to be expanded.

Mention should also be made of the need for making more efficient use of the feed resources of a forest. The introduction of developed technologies for processing the waste products of the lumber and wood processing industry and the extensive production of wood molasses, wood-foliage silage and wood mixed feed is making it possible to obtain an additional source for feeding large-horned cattle in the forest regions of the country.

The foundation for implementing improvements in the feeding of swine and poultry is that of increasing the production of balanced feeds to the level of the complete requirements for them. In poultry raising and especially in swine breeding, a protein deficit is being observed which is resulting in a raised consumption of grain per unit of product. Thus it is necessary once again to emphasize the need for expanding the production of pulse crops (peas, soybeans and others). This will make it possible to lower the consumption of grain for feed purposes.

A vital task is that of optimization of the structure for grain production. Wheat constitutes a large proportion of the grain being produced. The volumes of corn for grain, barley and oats being produced are insufficient. And these grain crops are better than wheat as components in a ration. Corn and barley varieties having a raised lysine content appear to hold great promise for the future. Their use should improve the quality of the feed being supplied to the livestock.

Another important problem in the feeding of swine and poultry -- the deficit in full-value protein of animal origin. Protein obtained by microbiological synthesis can compensate for this shortage. Such protein, in terms of its qualities, is very close to the full-value proteins of animal origin. For solving the protein deficit problem, equal importance is also attached to developing the production of irreplaceable amino acids.

Problems of an Industrial Technology for the Production of Animal Husbandry Products.

It is generally known that animal husbandry is a labor-consuming branch of agriculture and that its personnel problem is constantly becoming more acute. In this regard, an increase in labor productivity and improvements in the working conditions of the livestock husbandrymen are indispensable conditions for further increasing the production of animal husbandry products.

During the past few years, the scientific-research and planning institutes, based upon studies carried out and a summary of leading domestic and foreign experience, have created an efficient technology for producing the principal products of animal husbandry on an industrial basis.

In conformity with the 16 April 1971 decree of the CC CPSU and the USSR Council of Ministers entitled "On Developing the Production of Animal Husbandry Products on an Industrial Basis," a general program is being implemented throughout the country for the construction of large mechanized farms and complexes.

The following facilities are already in operation: 926 milk production complexes representing an overall planned capability for handling 689,000 cows and producing 2.39 million tons of milk; 66 large beef production complexes having an overall planned capability for producing 157,500 tons of increase in live weight annually; 178 state complexes for the production of pork having a planned capability for handling 6.25 million head and for producing 682,100 tons of increase in live weight. Poultry raising has been converted over to an industrial technology almost completely. In sheep raising, this process is in the final stages.

Analysis has shown that, for the most part, the conversion of a number of animal husbandry branches over to an industrial technology has brought about a substantial increase in labor productivity and improvements in the working conditions of the livestock husbandrymen. At complexes for the production of milk, during the 1975-1978 period, labor expenditures per quintal of milk decreased from 6 to 5.3 man-hours and the average milk yield per cow increased from 2,283 to 2,738 kilograms of milk annually. The corresponding indicators for sovkhozes were 7.4 man-hours and 2,409 kilograms.

The highest milk yield indicators were achieved by complexes in the Estonian SSR (3,284 kilograms), Belorussian SSR (3,113 kilograms) and Lithuanian SSR (3,200 kilograms). At 80 dairy complexes throughout the country obtaining an average milk yield of 3,500 kilograms of milk per cow, the labor expenditures were 3.33 man-hours per quintal of milk. However, the production cost for the milk at complexes is still high and amounts to 27.8 rubles.

Within the country there are complexes (Lensovetovskiy and Kotel'skiy in Leningrad Oblast and Shilovskiy in Sverdlovskaya Oblast) in operation where the average milk yield is on the order of 4,000-4,500 kilograms of milk per cow annually, labor expenditures amount to 1.9-3.6 man-hours and feed expenditures -- 1.1-1.2 quintals of feed units per quintal of product.

On the whole, it can be stated that although substantial progress has been achieved in realizing economies in the use of labor, nevertheless full use is not being made of the technical potential embodied in the technology. This is explained by the absence of a developed and stable feed base and by shortcomings in the acquisition of the livestock in conformity with the requirements of the industrial technology.

During the upcoming period, the most important task, in addition to the construction of new installations, will be that of bringing complexes which are already in operation up to their planned capability. This will be accomplished by strengthening their feed base, staffing them with high quality livestock, raising the skills of their workers, improving the organization of labor and strengthening technological discipline.

In order to accelerate the conversion of dairy cattle husbandry over to an industrial technology, existing farms should ideally be redesigned and modernized. For example, the redesign of dairy farms was carried out for this purpose at establishments in the Estonian SSR and their capability was increased through additional construction and the rational use of old cowhouses for the maintenance of young stock and dry cows.

A strong requirement exists for organizing the industrial production of construction parts and equipment for the modernization of farms. This will make it possible, with reduced expenditures and at high rates, to convert such a labor-consuming branch of animal husbandry as dairy cattle husbandry over to an industrial basis.

An industrial technology has been introduced into the beef production processes to a considerable degree. Analysis has revealed it to be highly effective: the average daily increase in live cattle weight at complexes is higher by a factor of almost two, the direct labor expenditures are less by a factor of 4.6 and the production costs are 60 percent lower than those at farms of the conventional type. At leading complexes (Mir in Brestskaya Oblast, Voronovo in Moscow Oblast and Yumatovskiy in the Bashkirskaya ASSR), the average daily weight increase equalled 1,022-1,090 grams, labor expenditures -- 2.7-3.4 man-hours, feed expenditures -- 5.4-5.8 quintals of feed units and the production costs amount to 99.7-105.3 rubles.

An industrial technology was introduced into swine raising operations on a considerably more extensive scale and its advantages are manifested very clearly here. Thus, the average daily increase in live weight at all state complexes equalled 421 grams, or higher by a factor of 1.66 than that at conventional farms, labor expenditures were lower by a factor of 3.4 and feed consumption equalled 5.7 quintals of feed units compared to 9.2 quintals at conventional farms, that is, lower by a factor of 1.6 and production costs were lower by a factor of 1.51.

In attaching great importance to converting the branch over to an industrial technology, it is also recognized that its chief advantages lie in a considerable increase in the labor productivity of the animal husbandry workers and economies in the use of live labor. However, the differences between the variants of the technology are not as great in terms of production costs, level of production profitability and return on capital investments.

Here other factors rise in importance: an increase in the yield of nutrients per unit of space, the level and quality of feeding and the genetic potential productivity of the animals, that is, factors associated with an increase in the level of productivity for the animals and which constitute the biological component of the biological technology. The technology can produce high results when the sum of all of the other factors ensure a high productivity for the animals.

In animal husbandry, the all-round effect of a number of factors on the final results is clearly manifested. The failure to properly evaluate just one factor can reduce to zero the effectiveness of the entire system. An expert evaluation carried out on the effect generated by the principal factors on the level of productivity and the effectiveness of the cattle husbandry branch in the near future has revealed that the factors of feeding will determine by 59 percent the growth in the production of cattle husbandry products, the animal breeding factors -- by 24 percent and technological factors -- by 17 percent. It is obvious that a quantitative evaluation is extremely approximate, however the priorities of the factors were established clearly and beyond question.

The task of increasing the level and improving the quality of feeding is more urgent in the case of animal husbandry. It is the chief reserve for increasing the production of goods within the branch. At the same time, the effectiveness of breeding work based upon large-scale selection methods developed by science must be increased at a rapid rate. In the process, the industrial technology for production operations must be improved.

Only an all-round solution for these most important problems and the integration of the decisive factors associated with branch development will create a strong foundation for raising the rates of growth for the production of meat, milk and other products and for improving their quality and lowering production costs.

It has become completely obvious that during the current five-year plan it will be necessary to focus additional attention on the intensive factors for growth in the production of animal husbandry products and to establish strict control over the basic indicators for production intensification, such as milk yield per cow, average daily increase in live weight of animals and others. Indeed, in the final analysis, only planned improvement in these indicators will ensure intensification of the branch, a sharp increase in the level of production of animal husbandry products while realizing greater economies in feed consumption and less specific outlays for capital investments while making more rational use of labor resources.

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## LEGAL RIGHTS OF MOLDAVIAN PRIVATE PLOT FARMERS REVIEWED

Kishinev SEL'SKOYE KHOZYAYSTVO MOLDAVII in Russian No 2, Feb 81 pp 56-57

[Article by G. Sivatskiy, chief legal consultant-organizer of the legal service of the Moldavian SSR Kolkhoz Council: "The Legal Status of the Private Plot"]

[Text] The right to a private farming operation as a constituent part of the personal property of working people is guaranteed by Article 13 of the USSR Constitution and the Constitution of the Moldavian SSR.

In conformity with the land law of the Moldavian SSR, kolkhozes, sovkhozes, sovkhoz-tekhnikums, sovkhoz-plants, interfarm enterprises and associations, and other agricultural enterprises and associations grant private plots from the land assigned to them for the use of the families of kolkhoz members, workers, employees, and other persons.

The private plot of land is granted to the families of kolkhoz members (kolkhoz households) following a decision of the general meeting of kolkhoz members or a meeting of authorized officials. The amount of land is as provided in the kolkhoz charter, taking into account the number of persons in the kolkhoz member's family and their participation in the public sector of the kolkhoz.

Permanent workers, specialists, and employees of sovkhozes, sovkhoz-tekhnikums, sovkhoz-plants, and educational-testing, and forest enterprises who live and work in rural areas are granted no more than 0.30 hectares of private plot land per family, depending on the land resources available at the farm and considering participation by able-bodied family members in public production.

Teachers, doctors, medical and pharmaceutical workers, agronomists, veterinarians, animal specialists, land use planners, and other specialists working at agricultural enterprises, institutions, and organizations, as well as the employees of production subdivisions of the Moldavian SSR Ministry of Land Improvement and Water Management, the Moldavian SSR Ministry of Procurement, and interfarm and state-cooperative associations, enterprises, and organizations who are permanently employed in living in rural areas are granted private plots of up to 0.25 hectares per family.

Workers and employees, pensioners, and disabled persons living in rural areas may be granted up to 0.15 hectares for private plots if there is available land at the kolkhozes, sovkhozes, interfarm enterprises and associations, and other state agricultural enterprises, organizations, and institutions.

The above-listed persons are granted plots of land for their use: from kolkhoz land following a decision of a general meeting of kolkhoz members (or a meeting of authorized officials); from the land of sovkhozes and other state agricultural enterprises and interfarm and state-cooperative associations, enterprises, and organizations, following an order (decision) of the farm governing body.

Citizens who work and live in a rural area and do not have private plots may be granted temporary use, for a period of up to three years, of plots of land for private gardens. These plots can be 0.10 hectares per family if the farm has available land. At a kolkhoz this is done on the decision of a general meeting of kolkhoz members (or authorized officials) or by the governing body of the farm; land is granted from state reserves on a decision of the executive committee of the rayon Soviet of People's Deputies, while land under the direct management of the rural Soviet of People's Deputies is granted on a decision of that body.

The body whose decision grants the plot of land makes up two copies of the certificate of the right to secondary use of the land: the first copy is issued to the secondary land user, while the second copy is added to the file of land records of primary land use.

Our land law begins from the principle of specific designation of each land use. This means that the one who receives the land can only use it for those purposes which have been designated. In conformity with this principle and the target designation of the private plot land, the Land Code of the Moldavian SSR directly stipulates that the families of kolkhoz members, workers, employees, and other persons are given land for gardens, orchards, and certain other needs (location of bee colonies, residential and work structures, and the like).

Kolkhoz members, workers, employees, and other citizens are obligated to control weeds, pests, and agricultural plant diseases in their private plots and gardens and to work them personally with their family members. Arbitrary exchanges, buying and selling, mortgages, gifts, renting, and other transactions are categorically forbidden, as are the use of hired labor and sale or purchase of standing crops or unharvested fruit. If the plots of land are used for an improper purpose they are transferred to other persons and the right of the citizens to use these plots is cancelled.

The right of citizens to use plots of land that have been granted can be cancelled in the following cases: voluntary failure to use the plot; expiration of the time for which the plot was granted; resettlement by all members of the household or family to a different place of permanent residence; the occurrence of a need to withdraw the land for state or public needs, when the plot has not been used for two consecutive years; and, where the plot was granted for individual housing construction and the citizen, without good reason, has failed to build a residence in the time established by the rayon, city, settlement, or rural Council of People's Deputies.

Each family of a kolkhoz member, sovkhoz employee, or employee of another state agricultural enterprise, organization, institution, interfarm association, or other enterprise enters definite obligatory relations with both the farm and the state. When they receive a private plot, kolkhoz members, sovkhoz employees, and employees of interfarm associations and enterprises guarantee participation in public production by the able-bodied members of the family who are obligated to contribute their personal labor to the public sector. Failure to fulfill this obligation may lead to a reduction in the size of the private plot that the family can use.

The owners of private plots are obligated to the state for payment of the agricultural tax and the mandatory insurance payment.

Citizens have the right to dispose of the crop and animal husbandry output of their own private farming operation as full-fledged owners. They can sell it on the side. They can also sell it to the state. They are not given plans for state purchases.

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# AGRO-ECONOMICS AND ORGANIZATIONS

## INCREASED SOVKHOZ ACCOUNTABILITY FOR FINANCIAL OPERATIONS URGED

Moscow FINANSY SSSR in Russian No 3, Mar 81 pp 7-12

[Article by V. N. Semenov, member of the Collegium of the USSR Ministry of Finance: "Make Sovkhozes More Accountable for the Results of Their Activities"]

[Text] The draft document of the CPSU Central Committee for the 26th party congress entitled "Basic Directions of Economic and Social Development of the USSR for 1981-1985 and the Period Until 1990" envisions increasing the accountability of economic managers for the results and quality of work, fulfillment of plan assignments and contract obligations, and accelerating the rate of turnover of working capital at sovhozes.

The grain sovkhozes are located chiefly in the zones of unstable farming. In these regions, despite irrigation and the latest scientific farming practices, the yield still depends greatly on the weather. In the current phase of development of agricultural science and productive forces it is impossible to fully eliminate the effect of unfavorable production conditions on gross harvests of agricultural crops and the financial condition of the sovkhozes. This means that it is very important to provide timely compensation for losses suffered for these reasons.

The public form of ownership of means of production entails compensation for sovkhoz losses owing to natural disasters or other unfavorable production conditions at the expense of society. But the cost accounting [khozraschet] mechanism envisions a differentiation of losses according to causes depending on the activities of the economic unit and those that do not. Among the latter factors are weather conditions or circumstances that change the production and sale of output and change in the prices of industrial goods delivered to the sovkhozes.

Society has no problem with the question of which sources to use to compensate sovkhozes for loss from natural disasters: the budget or a special fund formed from sovkhoz capital. In both cases this is society's net income. But planned management of the national economy, the planning of financial resources, and the cost accounting activities of the sovkhozes necessitate a certain reserve to compensate for possible losses. Planning excessive sources, naturally, leads to freezing financial resources, diverting them to purposes not linked to expanded reproduction. Searching for additional resources in the process of execution of the budget requires complex work to balance income and expenditures and to insure the assigned rate of national economic development.

The state can only compensate for unproductive expenditures and losses that do not depend on the activities of the enterprise; those problems that are caused by its poor work are not acknowledged by society. The enterprise itself is responsible for such losses and expenditures, even though its means of production, labor, and output belong to society. This is the essence of the cost accounting mechanism, which contemplates above all that the enterprise is accountable for the results of its activities. In the very first years of Soviet power V. I. Lenin wrote as follows: "I think that trusts and enterprises are founded on cost accounting precisely so that they will be responsible, fully responsible, when their enterprises do not earn a profit."[1] Lenin's thought has been developed and elaborated as the sovkhozes have moved to new conditions of economic activity.

There is no question that the enterprise should be responsible for losses that occur through its own fault, but the dependence of agriculture on weather conditions and damage caused by natural disasters requires special sources which can guarantee the continuous production process. For state enterprises in this case, it is not profit, but rather the shortfall of the enterprise's own working capital that must be reimbursed. This is by no means the same thing.

The proportion of losses from natural disasters in the total shortfall of enterprises' own working capital in 1971-1979 was just 15 percent. The shortfall of enterprises' own working capital is expressed as the sum of losses permitted and unearned profit used to finance planned measures. Withdrawal of profit and other capital without a change in the norms of enterprises' own working capital is also reflected in the amount of the shortfall. During the above-mentioned years the shortfall of kolkhozes' own working capital was made up as follows: 82 percent — above-plan losses; the remaining 18 percent — financing of planned measures with failure to fulfill the profit plan and above-plan expenditures to cover losses for the housing and municipal services system, to maintain Pioneer camps, and the like.

For the years in question losses at certain sovkhozes made up the following percentages of the shortfall of the sovkhozes' own working capital:

| Years | Percentage |
|---|---|
| 1971 | 109 |
| 1972 | 82 |
| 1973 | 105 |
| 1974 | 94 |
| 1975 | 98 |
| 1976 | 138 |
| 1977 | 93 |
| 1978 | 120 |
| 1979 | 90 |

In 1940 an insurance fund was formed by 15 percent deductions from profit to compensate sovkhozes for losses from natural disasters and other unfavorable production conditions. The compensation mechanism at the sovkhozes was fundamentally different from the mechanism at the kolkhozes, where a system of state insurance of property against natural disasters was already in effect. In 1941 the size of the insurance fund was increased to 30 percent of planned and above-plan profit. At this time half of the amount was transferred to the insurance fund of the USSR People's Commissariat of Sovkhozes or the People's Commissariat of Sovkhozes of the appropriate Union republic depending on the subordination of the farm, and the other half was left at the disposal of the sovkhozes. Special accounts were opened for sovkhozes to keep track of receipts and expenditures of insurance fund capital. This capital was spent with the authorization of the People's Commissariat of Sovkhozes, and money not used during the year was carried over to the next year.

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[1] Lenin, V. I., "Poln. Sobr. Soch." [Complete Works], Vol 54, p 150.

This system made it possible for the sovkhozes to accumulate reserves to compensate for losses from natural disasters and strengthen the cost accounting system and finances of the farm, which were able to maneuver more broadly with financial resources. But a number of sovkhozes with stable yields and high profitability did not use the insurance fund. For this reason, in 1948 all the capital of the insurance fund was centralized at the USSR Ministry of Sovkhozes and the Union republic ministries of sovkhozes. In this way the ministry began disposing of the entire insurance fund, and as a result the maneuverability of financial resources was enhanced.

At first the capital in the insurance fund was used to cover losses from natural disasters, and then in 1956 it began to be used to cover the entire shortfall of sovkhozes' own working capital. With the transition to full cost accounting sovkhozes began deducting to the insurance 20 percent of actual profit minus the payment to the budget for agricultural production fixed capital.

Part of economic stimulation funds and bank credit can also be used to cover a shortfall of working capital. In this case the reasons for the shortfall are taken into account, whether it depended on the activity of the farm or not.

With the exception of cases where the shortfall did not depend on the activities of the farm, sovkhozes that have not preserved their own working capital are obliged to replenish it by taking organizational-technical steps that will insure additional profit in the future, and sometimes temporarily (for a period of up to two years) reducing deductions from profit to econ [illegible] by up to 30 percent. Higher-ranking organizations replenish the [illegible] these sovkhozes' own working capital not resulting from their own fault (natural disasters, drought, hail, floods, epidemics, and the like). Gosbank gives credit for up to two years to replenish temporarily the shortfall at sovkhozes that have changed to full cost accounting; in return the farms are obligated to take concrete steps to replenish the amount themselves.

With the transition to full cost accounting, the question of insuring expanded reproduction in the case of failure to fulfill the profit plan became especially critical at the sovkhozes. In cases where farms have not, for reasons not depending on their own production activities, earned the planned profit earmarked for capital investment, Gosbank is supposed to grant them long-term credit for periods of up to five years. In view of the lack of security, in practice such credit is rarely granted.

During the years 1971-1979 the shortfall of sovkhozes' own working capital at farms of the system of the USSR Ministry of Agriculture were compensated for by the following sources:

| | Percentage |
|---|---|
| Insurance Fund | 20.2 |
| Economic Stimulation Fund | 0.2 |
| Free Profit | 2.0 |
| Budget Appropriations | 29.6 |
| Temporary Postponement of Indebtedness on Bank Loans | 48.0 |

We can see that, including the insurance fund, sovkhozes compensated for just [illegible] percent of the shortfall of working capital, while 48 percent was compensated for temporarily through bank credit. As a result, many low-profitability sovkhozes fell deeply into debt on postponed bank loans with no guarantee of repayment.

Thus, the results of sovkhoz work on full cost accounting provided a fairly imperfect model of compensation for their losses and use of the capital of the insurance fund.

In the first place, increasing material accountability for the shortfall of the sovkhoz's own working capital by reducing deductions from profit to stimulation funds does not achieve its purpose. The sovkhozes reduced these deductions only slightly.

In the second place, the principle of farm accountability for the results of its activities has been modified in fact by later decisions. The higher-ranking organization today is able to cover a shortfall of the enterprise's own working capital regardless of the reasons for its formation. The free remainder of profit from other sovkhozes is used for this purpose; the only problem is planning its use. Some economists argue that the shortfall of enterprises' own working capital should be covered by the free remainder of profit because the trusts and ministries of sovkhozes and agriculture have been switched to cost accounting. But this kind of cost accounting violates the cost accounting stimuli directly in sovkhoz production.

In the third place, since 1971 the sovkhoz insurance fund has been used to compensate for shortages of sovkhozes' own working capital that formed through their own fault. Needless to say, this lowers the accountability of the farm for the results of its activities.

There must be a guaranteed source for compensation for losses from natural disasters and underproduction owing to unfavorable production conditions in order to continue improving cost accounting at the sovkhozes. At the same time, the farm should continue to be accountable for losses that are its own fault.

Following the decisions of the July 1978 Plenum of the CPSU Central Committee, unprofitable and low-profitability sovkhozes were permitted to write off 5.1 billion rubles worth of indebtedness on postponed and overdue bank loans, including writing off by time of payment, at the expense of the USSR budget. This occurred as follows: 3.7 billion rubles in 1978, 0.8 billion rubles in 1979, and 0.6 billion rubles in 1980. In addition, a 12-year postponement was granted in repayment of unsecured sovkhoz indebtedness on bank loans in the amount of 2 billion rubles and the sovkhozes were released from any obligation to pay interest on these loans. In every rayon and oblast agricultural agencies determined the amount of the write-off and postponement of indebtedness. Help was given primarily to those farms whose repayment date on the loans came in 1978-1980. The lists of sovkhozes with an indication of the amount of bank loan indebtedness subject to write-off and postponement were ratified by the oblast executive committees and Councils of Ministers of the Union republics in agreement with the appropriate offices of the USSR Gosbank.

While reviewing the questions of unprofitable and low-profitability sovkhozes, the agricultural agencies and credit institutions worked out additional measures to raise agricultural production, increase labor productivity, reduce the prime cost of output, and make fuller use of internal reserves at the farms. Financial agencies also participated actively in this work. In certain oblasts of the

RSFSR, Kazakhstan and Kirghizia, however, the work was not done at the proper level. The financial agencies in these places did not take a principled position and relaxed their monitoring of the efficient use of capital allocated for financial aid, to see that it did in fact strengthen the economic condition of the low-profitability sovkhozes. In the Kazakh SSR, for example, part of the appropriations were used, without proper substantiation, to repay indebtedness on loans issued for production expenditures in 1978, while leaving indebtedness on postponed loans from earlier years unpaid. In some rayons of the republic help was given without considering the financial condition of the sovkhozes, as a result of which some of them formed surpluses of working capital. These appropriations were redistributed based on the results of audits made in 1979.

The decision of the July 1978 Plenum of the CPSU Central Committee to apply the state insurance system established for kolkhoz property to the agricultural enterprises of the USSR Ministry of Agriculture system as of 1 January 1979 has been very important for bolstering the economic condition of the sovkhozes and insuring a normal production cycle in cases of natural disasters or other unfavorable production conditions. If insured property of agricultural enterprises is destroyed or damaged the enterprises are compensated for: 50 percent of the damage for crop losses, 70 percent for livestock and poultry, and 100 percent of the loss to buildings, structures, and other property.

Thus, current laws and enactments on state insurance have been applied fully to sovkhozes and other state agricultural enterprises of the USSR Ministry of Agriculture system. The insurance premiums for them are established by the Councils of Ministers of the Union republics in agreement with the USSR Ministry of Finance and the USSR Ministry of Agriculture. The rates are set so that for the Union Republic as a whole they correspond to the average level of payment of insurance compensation calculated based on loss: over 10 years for crop and perennial planting insurance, and over five years for animals, buildings, structures, and other property. The rates are identical to those established for kolkhozes. These rates are adjusted with due regard for changes in the level of insurance compensation payments.

Because of the application of mandatory state property insurance to the sovkhozes in 1979, insurance payments were 1.7 billion rubles or 3.4 percent of the prime cost of output. Prime cost rose by an equal amount. Highly profitable sovkhozes contributed 0.7 billion rubles; low-profitability and unprofitable sovkhozes, named in lists ratified by the Councils of Ministers of the Union republics for budget financing of capital investment and other expenditures, paid 1 billion rubles. At the same time 2.1 billion rubles was received from agencies of Gosstrakh [Main Administration of State Insurance] to compensate for sovkhoz losses. Because losses at the low-profitability and unprofitable farms increased by the amount of the insurance premiums, the budgets of the Union republics provide for an annual appropriation of 1 billion rubles to make these payments. Similar appropriations are not envisioned for sovkhozes subordinate to the USSR ministry which do not receive subsidies from the budget for expenditures related to expansion of production. The appropriations are reflected in the income and expenditure balances of the ministries of agriculture of the Union republics.

At the beginning of the quarter the ministries of finance of the Union republics opened credit accounts for the Union republic ministries of agricultures in the full amount of the appropriations envisioned to compensate for insurance payments by the sovkhozes and other agricultural enterprises. In their turn, the ministries transfer these appropriations to the agricultural agencies in charge of the particular sovkhozes and other state agricultural enterprises for subsequent transfer to special loan accounts or, where there are none, to the current accounts of the farms.

In the production-finance plans of the farms premiums for mandatory state property insurance are envisioned in expenditures for the production of output. In accounting records these payments are entered as expenditures for production as the times for payment of premiums occur. Because they are shown as production expenditures, insurance premiums are covered by bank credit if the budget appropriations for these purposes as a part of production expenditures do not arrive on time or are insufficient. Thus, a reliable mechanism has been created by which the farms make their insurance payments.

Appropriations to reimburse low-profitability and unprofitable sovkhozes and other state agricultural enterprises for insurance payments have been set, as indicated above, at 1 billion rubles. When the insurance premiums are more, they are treated as farm losses. It is important to establish the total of insurance premiums for each low-profitability farm. Financial agencies must transfer the capital due to the ministries of agriculture at the proper time and monitor its subsequent transfer to the sovkhozes and other agricultural enterprises.

The appropriations received by farms from agricultural agencies to compensate for insurance payments they have made are reflected in the results of their activity. Where the appropriations have been correctly transferred, the payment of insurance premiums by low-profitability and unprofitable farms does not in fact impair these results.

Payments received from insurance for lost property are reflected in the same way as is done at the kolkhozes: in the results of work for crops, young livestock, and commodity-material assets that are completely destroyed, and in a reduction in expenditures for crop farming and animal husbandry for partial losses. Compensation for fixed capital (excluding livestock) is transferred to the fund for strengthening and expanding the farm. It then loses its specific designation and is used either to finance planned capital investments or for expenditures beyond the plan, to the extent that material resources are sought.

The sovkhozes and other farms must use the sums of insurance compensation for lost crops, livestock, and material assets to repay unsecured indebtedness on short-term bank loans given in connection with failure to produce enough output and the loss of crops, livestock, and material assets. Amounts paid in compensation for destroyed fixed capital built and purchased with the participation of bank credit is used to repay indebtedness on this credit. Such a system promotes timely repayment of loans issued by the bank for production expenditures and capital investment.

Property insurance provides basic compensation for the losses of sovkhozes and other agricultural enterprises owing to natural disasters and other unfavorable production conditions. Because the losses incurred by the farms are not fully compensated, they will have a shortage of their own working capital.

Unlike the situation at the kolkhozes, establishing working capital norms at sovkhozes necessitated keeping reserve funds to cover shortages of the farms' own working capital resulting from failure of insurance compensation to cover the full loss. The insurance fund was converted into the reserve fund of the sovkhozes and other state agricultural enterprises of the system of the USSR Ministry of Agriculture.

The reserve fund is formed by 20 percent deductions from the distributed profit of sovkhozes and other state agricultural enterprises. Because the sovkhozes of the RSFSR and Kazakhstan suffer from natural disasters and other unfavorable production conditions more frequently, the Councils of Ministers of these republics were given the right to increase the amount of deductions to the reserve fund to 30 percent. The Councils of Ministers of the other Union republics can lower the established amount with the consent of the Ministry of Agriculture and USSR Ministry of Finance so that the total sum of deductions will insure replacement of a shortage of working capital and repayment of unsecured indebtedness on bank loans.

Up to 50 percent of the total amount of deductions to the reserve fund remains at the disposal of the farm; the rest is transferred to the centralized reserve fund of the ministry of agriculture to which the enterprise is subordinate. The amount of capital in the reserve fund left to the sovkhozes is determined by the republic ministries of agriculture based on profitability and production conditions. For example, the poultry factories and hothouse combines of the RSFSR virtually never experience natural disasters, so the reserve fund left at their disposal is not more than 3-5 percent of profit.

Sovkhozes transfer capital to the reserve fund each quarter. Because their profit is finally determined only for the entire year based on the balance on 1 January and expected profit is determined based on the report for the first nine months and calculated figures for the fourth quarter, deductions to the reserve fund in the first and second quarters are made in the form of advances. Deductions based on the report for the first nine months are made from expected profit for the year, but not more than 80 percent of the amount earmarked for the reserve fund. The sovkhozes transfer the money subject to contribution to the centralized ministry reserve fund in the month following ratification of their annual report.

The reserve fund is used to cover losses from natural disasters or a shortfall of output which was not reimbursed by Gosstrakh, to repay unsecured indebtedness on bank loans, and to replenish a shortage of the enterprise's own working capital. The farms transfer capital from this fund that has not been used for three years to the centralized ministry fund in the amount of one year's deductions.

Reserve fund capital is kept in the accounts of the ministries at Gosbank offices for redistribution of profit and other working capital. Part of the capital in this fund is put at the disposal of the oblast agricultural administrations and sovkhoz trusts to achieve more mobile regulation of ministry financial resources. Sovkhozes on full cost accounting keep reserve fund capital in current accounts. Capital from the centralized reserve fund is spent on the basis of an order by the ministry of agriculture, sovkhoz trust, or agricultural administration to which the sovkhoz is subordinate. Within the sovkhoz itself the money is used on the order of the director. The higher-ranking organization allocates money to the sovkhozes based on the abilities of the farms themselves to compensate for losses and the availability of capital in the centralized reserve fund.

The existing system for formation and use of the reserve fund, on the one hand, gives the farms an interest in profit and creating this fund because they themselves can use it to overcome financial difficulties. On the other hand, to some degree it evens out the unequal working conditions of the farms. Moreover, keeping the reserve fund capital of the sovkhozes in their current account increases the amount of their own working capital that is in circulation. This reduces the need for short-term bank loans and increases the possibility of maneuvering with financial resources.

Application of the state property insurance system to the sovkhozes together with the creation of the reserve fund from profit and using part of its free balance generally assures replenishment of a shortage of the enterprise's own working capital caused by natural disasters and other unfavorable production conditions. In especially bad years this capital will not, of course, be adequate. In 1979 the sovkhozes had the following financial resources for this purpose:

| | Rubles | % of Total |
|---|---|---|
| Receipts from Gosstrakh Agencies To Compensate for Losses | 2.1 billion | 58 |
| Reserve Fund Capital | 1.1 billion | 31 |
| Free Balance of Profit | 0.4 billion | 11 |
| Total | 3.6 billion | 100 |

It must be observed here that the high-profitability sovkhozes contributed only 0.7 billion rubles to Gosstrakh agencies and the low-profitability sovkhozes paid 1 billion rubles, for which they were reimbursed from the budget, whereas 2.1 billion rubles was received to compensate for losses.

The challenges of raising the efficiency of production and reducing unproductive losses and expenditures, posed by the decisions of the 25th CPSU Congress, the July 1978 and November 1979 Plenums of the CPSU Central Committee, and the draft document of "Basic Directions" for the 11th Five-Year Plan, demand that sovkhozes be more accountable for the results of their financial-management activity. Losses from completely destroyed crops caused by natural disasters are just 15-20 percent of the total loss. It is urgently necessary to improve the mechanism of compensation for losses.

In our opinion, the multiple sources of compensation for a shortage of the enterprise's own working capital diminish the accountability of sovkhozes for the results of their work. Agricultural agencies frequently render financial aid to sovkhozes without proper analysis of their activities. But this is mere support. It does not help root out the causes of the losses and it gives rise to irresponsibility. The causes must be rigorously defined: Do they depend on the farm or not? We now have a reliable basis for this. Losses from natural disasters or failure to produce the full amount of output owing to unfavorable production conditions are analyzed by Gosstrakh agencies with the participation of representatives from the sovkhoz and the executive committee of the rayon or rural Soviet.

Bank institutions have a large part to play in providing money at the right time to maintain an uninterrupted production process. Above all they are reliable partners of the sovkhozes in fulfilling plans for production and sale of output to the state. At the same time the bank may bolster its monitoring of the financial activities of an enterprise to insure timely repayment of loans it has issued. Bank institutions must be more active in helping sovkhozes that have suffered from natural disasters and other unfavorable production conditions, granting them broader credit on the condition that they take steps which are expected to improve the work of the farm. At the same time, the sovkhozes should not be released from the responsibility of repaying loans on time. The bank has fairly powerful levers to influence an enterprise, up to and including cutting off its credit and declaring it insolvent. All forms of economic influence should be used to increase production and sale of output with minimum expenditures of labor and capital.

Under the existing system, when ministries have insufficient reserve funds to cover losses from natural disasters, repay unsecured indebtedness to the bank, and replenish a shortage of the sovkhozes' own working capital, the bank gives them credit for periods of up to three years. The source for repayment is future deductions to the insurance fund.

Granting ministries credit against the security of the reserve fund enhances the role of agricultural agencies in giving financial aid to the sovkhozes, but at the same time it lessens the influence of bank institutions on raising the efficiency of agricultural production. Granting such credit directly to the sovkhozes would strengthen bank control of farm activity and the security for loans granted. A sovkhoz which receives a loan against the security of its reserve fund would be directly responsible for timely repayment.

The transition of the sovkhozes to full cost accounting made it critical to reflect all monetary and physical losses in the records. The existing accounting system does not show all such losses at a farm. Let us take monetary losses from the death of livestock. The cost of young animals who have died is directly reflected in the results of the farm's work. Sovkhozes account for all expenditures to produce weight gain, so the cost of the lost cattle is reflected above all in the prime cost of a unit of weight gain. The cost of adult livestock who die is accounted for in a completely different manner.

The death of adult livestock belonging to the basic herd (cows, bulls, hogs, and sheep) is mechanically recorded as a reduction in "charter capital" and is not reflected in the results of the sovkhoz's activity. This distorts the actual results. In 1979 0.2 billion rubles of losses from the death of adult livestock were subtracted from the "charter capital" of the sovkhozes. In reality, their profit was overstated by that amount. It would appear that the cost of adult stock of the primary herd who die should be reflected in the results of the farm's work, just as is the case with young animals. Then these losses will be realistically reflected in the farm balance and the sovkhozes will have a stronger interest in preserving their animals.

Losses from natural disasters which are not reimbursed by insurance payments are reflected in the results of the farm's activities, that is, they lower their profits or increase their losses. At the same time, reserve fund capital is transferred to the Property Loss account to compensate for sovkhoz losses. As a result, the losses of the farm are mechanically reduced or its profits are increased. In 1979 0.3 billion rubles was transferred in this way. As it turns out, certain sovkhozes who have suffered losses owing to unfavorable production conditions receive profit from the reserve fund which was created with the profit of other farms. In this way, the economic stimulation funds and reserve fund are formed from the capital of the latter.

Sovkhoz property insurance is a great step forward in improving economic relations between agriculture and the state and strengthening cost accounting. In our opinion, the reserve fund capital transferred by the sovkhoz should be put in "charter capital." This would reduce the shortage of working capital formed as the result of incomplete compensation by insurance payments for losses from natural disasters.

In 1978-1979 economic stimulation funds accounted for one percent of the sources used to cover shortages of sovkhozes' own working capital. At the same time, two percent of the material incentive fund and the fund for sociocultural measures and housing construction was used to cover this shortage.

The conditions for formation of economic stimulation funds in practice prevent kolkhozes from using this capital in the established manner to cover a working capital shortage. And it is not just that sovkhoz interests prevail over public interests. The problem is that most sovkhozes suffering from a shortage of their own working capital do not have economic stimulation funds created out of actual profit. It would seem that future deductions to stimulation funds could be the source for replenishing the shortage. Therefore, it would be wise to grant bank credit against the security of future capital in the economic stimulation fund used to cover a shortage of the enterprise's own working capital. Furthermore, it should be determined that 30 percent of the stimulation fund capital is used for this purpose, but not more than the sum of the shortage.

Making up the shortage of working capital of certain sovkhozes with the profit of others does not help strengthen cost accounting. Profitable sovkhozes are using their profit not to expand production but to cover the losses of other farms, deducting 10 percent of this amount to stimulation funds.

It would seem that where the reserve fund capital is inadequate, sovkhozes could receive bank loans on the condition that steps are taken to eliminate the losses. In this case they would be truly accountable for the results of their financial activities. At the same time, it would enhance the role of bank institutions in monitoring efficient use of loans granted to sovkhozes both to cover seasonal losses and above-norm stocks of commodity-material assets and to render financial aid.

The increase in state purchase prices for agricultural output, the write-off and postponement of indebtedness on bank loans, and other steps that were taken to strengthen the economic and financial condition of the sovkhozes in conformity with the decisions of the July 1978 Plenum of the CPSU Central Committee created the necessary conditions for a continued rise in agriculture. Work to improve the finance-credit mechanism and strengthen economic and monitoring work by financial agencies should aim at a rise in the efficiency of agricultural production and the accountability of sovkhozes for the results of their activities.

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## AGRO-ECONOMICS AND ORGANIZATION

## LIVESTOCK RAISING PROMOTED IN PRIVATE, SUBSIDIARY UNITS

### Rabbit Breeding Advanced in Georgia

Tbilisi ZARYA VOSTOKA in Russian 5 Apr 81 p 2

[Article by Yu. Bagranov, department head at Georgian Scientific-Research Institute of Agricultural Economics and Organization: "Serious Affair of Amateurs"]

> [Text] Amateur rabbit raising is viewed as a rather important reserve for increasing the production of meat. This has been borne out in a very convincing manner by the experience accumulated in a number of republics and also krays and oblasts throughout our country.

For example, let us take Dnepropetrovskaya Oblast. Compared to the early 1950's, when the amateur rabbit raisers here were raising 200,000 rabbits annually, today the figure has increased to 3 million. By the end of the Tenth Five-Year Plan, 350 tons of rabbit meat (in live weight) and 2.3 rabbit pelts had been procured from the oblast's population. Moreover, the plans for the first year of the Eleventh Five-Year Plan call for further increases in the procurements of this valuable food product.

The workers in Dnepropetrovskaya Oblast were able to achieve such results owing to the creation of the oblast and rayon Krolikovod societies. At the present time, this society numbers more than 17,000 amateur rabbit raisers. The local soviets are furnishing them with a great amount of assistance. Thus, up to 50 percent of the entire annual grain forage marketing fund is being sold to the rabbit keepers in the form of an advance for products which, on the basis of a contractual agreement, they are obligated to turn over to the state. During the past few years, the society has procured and sold among its members 1,800 tons of grain, 300 tons of succulent feed and 600 tons of hay. The executive committees of local soviets are providing the amateur societis with perennial grass tracts and they are supplying them with lumber, metal and cement.

In recent years, a trend has been observed in our republic towards the development of amateur rabbit raising. In 1979, for example, the amateur rabbit keepers produced 98 tons of meat (in live weight) and sold 35,489 rabbit pelts to the state. They obtained 45,200 rubles of income just from the sale of these pelts alone.

In 1980 however, the production of meat on the private subsidiary farms decreased to 47.7 tons. The number of pelts delivered to the state decreased by 16,400.

There was one reason for this -- a weak feed base and the difficulties the rabbit keepers encountered in selling their rabbit meat, since the republic lacks an efficiently organized system for procuring this meat. As a result, a portion of the population either reduced the number of their rabbits or eliminated them entirely on their private plots and became consumers rather than producers of rabbit meat.

And this occurred at a time when studies convincingly emphasized the fact that opportunities exist within the republic for increasing the production of rabbit meat. Roughly speaking, the amateur rabbit keepers can increase their production of rabbit meat on their private subsidiary farms to 238 tons (in live weight) by the end of the 11th Five-Year Plan. This problem is particularly acute in light of the decisions handed down during the 26th CPSU Congress. In "The Principal Trends For the Economic and Social Development of the USSR During the 1981-1985 Period and the Period Up To 1990," it is written: "To increase the production of meat, milk, potatoes, vegetables and fruit on the private subsidiary farms of citizens and also in the horticultural, gardening and rabbit raising associations (societies) of manual and office workers and to provide them with assistance in obtaining milk, feed, seed and fertilizers."

We believe that the time is at hand for creating a republic and also rayon or inter-rayon societies of amateur rabbit keepers. Such societies would play an important role in increasing the production of meat and also in ensuring proper planning for meat procurements. Moreover, the republic society would obviously be attached to the Council of Ministers for the Georgian SSR and the rayon societies -- to the executive committees of local soviets. The production plans for the meat and pelts, established for the amateur rabbit keepers, must be based directly upon the national economic plan. Naturally, for a society to appear as an economic unit, it must be provided with a proper logistical base and feed resources.

An increase in the production of rabbit meat on the private subsidiary farms is directly dependent upon the organization of rabbit meat procurements. Thus the organization of such procurements must be thought out in a very thorough manner. Experience has shown that the sale of rabbit meat will at first be carried out in batches of from 5 to 15 head. Thus no economic requirements exists for creating slaughtering sites in each rayon. Obviously, it would be better here to adhere to the regional principle.

Thus the amateur rabbit keepers of Tbilisi and suburban rayons could deliver their output to the slaughtering shop of the Kumisskiy Rabbit Husbandry Complex. The rabbits being received from the population for slaughtering will not disrupt the rhythmic work of the enterprise and the pelts obtained from the rabbits will even make it possible to expand fur production here.

It is considered feasible to task the Kumisskiy Complex and similar enterprises throughout the republic with the function of procuring rabbits from the population and preparing the appropriate documents. With regard to payments for the products delivered, this function should be assigned to the republic's Ministry of Agriculture.

In addition, not all of the amateur rabbit keepers either wish to or are capable of managing a full-cycle rabbit raising economy. Some of them display a preference for raising young stock. This category includes citizens who own suburban plots and also schoolchildren. The number of such amateur rabbit keepers can be increased, for example, by opening a point for the sale of one and a half to two month old rabbits to the population at one of the kolkhoz markets in Tbilisi.

Rabbits are highly productive animals. It is sufficient to state that experienced rabbit keepers can obtain a quintal of meat annually from one female and its offspring. However, if such results are to be achieved by all rabbit keepers, then it will be necessary to improve their supply of feed. In this regard, feed should be traded in exchange for meat delivered to the state. Similar action should be taken in connection with the procurement of pelts.

By solving all of these problems, we will promote the development of amateur rabbit raising throughout the republic and thus make a worthy contribution towards solving the task advanced by the 26th CPSU Congress with regard to sharply increasing the production of meat throughout the country.

## Azerbaijan Subsidiary Enterprises

Moscow SEL'SKAYA ZHIZN' in Russian 26 Mar 81 p 4

[Article by M. Aslanly: "Agricultural Department in Operation"]

[Text] Two hundred subsidiary farms of enterprises and organizations have recently been created in the Azerbaijan SSR. This includes the farm of the Baku Grain Products Combine No. 2. It has a land area of 20 hectares. On it there are four hothouses having 2,000 square meters of space, six poultry houses and an incubator station. A pigsty has been built for 200 head and a poultry slaughtering department is in operation. The work of strengthening the agricultural department continues.

## Surplus Animal Products Solicited

Minsk SEL'SKAYA GAZETA in Russian 15 Apr 81 p 4

[Article by Main Administration for Procurements of the Cooperative Union of the Belorussian SSR of Belkooptorgreklama: "Comrade Kolkhoz Members, Manual Workers and Office Employees!"]

[Text] Sell the surplus products of animal husbandry to the republic's procurement organizations of consumer cooperation!

Large-horned cattle, swine, meat and fat can be sold, at agreed upon prices and in unlimited quantities, to livestock slaughtering points and travelling procurement specialists of consumer cooperation.

Public catering enterprises procure meat, fat, poultry, eggs and milk and stores -- meat, fat and eggs.

It is profitable and convenient for the suppliers of agricultural products to conclude an agreement for the sale of the surplus products to the procurement organizations of consumer cooperation.

An agreement for the sale of one or several types of products is concluded for 1 year or a number of years. In this instance, consumer cooperation guarantees the following for the suppliers:

-- the timely marketing of the agricultural products;

-- right of priority for acquiring goods for which there is a strong demand;

-- issuing of a monetary advance (if requested by the supplier) based upon products procured.

Citizens! If you so desire, workers attached to the procurement organizations, using their own transport vehicles, will deliver the livestock, meat, fat and other animal husbandry products to the receiving and livestock slaughtering points.

The livestock slaughtering points of consumer cooperation provide rapid and high quality services for the population. Here the carcass is dismembered in a skilful manner and can be procured and when livestock are slaughtered on a customer-supplied basis, the veterinary doctor provides information on the suitability of the slaughtering products for use.

With regard to the pelts of animals slaughtered at livestock slaughtering points, an additional payment is made amounting to 7 percent of the cost of the pelts and intestinal raw materials are paid for at the price for 1st quality material.

A veterinary statement must be available for each animal sent for slaughtering. Meat obtained from animals slaughtered locally is accepted only if it bears the stamp of the veterinary service.

All questions must be addressed to the rayon procurement offices of consumer cooperation.

Conclude agreements and sell the surplus animal husbandry products to the procurement organizations of consumer cooperation.

## Pinsk Farms Fattening Swine

Minsk SEL'SKAYA GAZETA in Russian 3 Apr 81 p 2

[Article: "Waste Products Converted Into Income"]

[Text] The trade network of the Pinsk Department of Workers' Supply of the Glavpoles'yevodstroy Administration has been supplied with the first quintals of pork obtained from its own fattening points. The subsidiary farms represent a considerable addition to the state funds. Facilities for the fattening of swine on food remnants have been built at many dining halls located on the central farmsteads of SMU's [construction and installation administration] and PMK's [mobile mechanized column]. This year, more than 19 tons of cheap meat have been obtained. This will enable the culinary experts to sell tens of thousands of rubles worth of additional products to the land reclamation specialists.

Small farms are increasing in number. During the 11th Five-Year Plan, their number will increase by no less than a factor of 1.5.

## Sverdlovsk Subsidiary Units Increasing

Moscow SEL'SKAYA ZHIZN' in Russian 27 Mar 81 p 2

[Article by I. Shevchenko: "Development of Subsidiary Farms"]

[Text] Throughout the oblast, a great amount of attention is being given to developing the subsidiary farms of industrial enterprises and the private farms of city and village residents. Over the course of a year's time, the kolkhozes and sovkhozes are selling 100,000 young pigs and 1 million each of chicks and ducks to city dwellers alone.

Special concern is being displayed for the young families. They are being provided with young large-horned cattle stock free of charge and they are receiving assistance in the construction of outbuildings. The kolkhozes and sovkhozes are selling calves at one half their cost to manual and office workers, teachers, doctors and pensioners. Thousands of rural workers in Sysertskiy, Kamyshlovskiy, Nev'yanskiy and other rayons throughout the oblast have already acquired their own livestock and poultry.

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## TILLING AND CROPPING TECHNOLOGY

# MEASURES FOR ACHIEVING OPTIMUM CROP YIELDS IN BELORUSSIA DISCUSSED

Minsk SEL'SKOYE KHOZYAYSTVO BELORUSSII in Russian No 3, Mar 81 pp 8-11

[Article by F.P. Sen'ko, Minister of Agriculture for BSSR: "So That the Fields Produce Grain"]

[Text] One of the principal tasks which we must actively solve during the 1980's in farming is that of raising considerably the fertility of the soil and the cropping power of the agricultural crops. This will make it possible to achieve steady growth in the production of grain, feed, flax, potatoes, sugar beets, vegetables, fruit and other products and to fulfill the planned tasks for the sale of products to the state, on a timely basis and in the full assortment. This important work must be directed by the agronomists, technologists and organizers of agricultural production -- enthusiasts for stimulating scientific-technical progress in the rural areas.

In connection with raising the fertility of our land, great importance is being attached to improving the work being carried out with organic and mineral fertilizers. A great deal has been accomplished in this regard during the past three five-year plans. Mineral fertilizer deliveries to the republic have increased by more than threefold. As a result, the productivity of the arable land during the 1976-1979 period reached 30.2 quintals of feed units per hectare and the output per hectare amounted to 76 feed units and 63 kilograms of grain.

However, the rates for soil cultivation vary for individual rayons, kolkhozes and sovkhozes. During the 1961-1965 period, the arable lands at the Osnezhitskiy Kolkhoz in Pinskiy Rayon, Zarya Kommunizma Kolkhoz in Dokshitskiy Rayon, Kolkhoz Imeni Voronetskiy in Berestovitskiy Rayon and Krasnaya Zvezda Kolkhoz in Stolbtsovskiy Rayon had agrochemical indicators which were typical for the entire republic. During the past 15 years, these indicators increased by a factor of from 2.8 to 3.8, while during the same period the average for the republic only doubled. The positive achievements were realized on the mentioned farms mainly owing to skilful and purposeful work aimed at increasing the production and improving the quality of organic fertilizers, utilizing mineral fertilizers and lime materials in the proper manner and also raising the overall culture of farming.

Great importance is attached to the task of smoothing out the differences in soil fertility. The realization of this most important reserve alone, considering the existing material-technical level, will make it possible to increase the productivity of the republic's arable land by an average of 4-4.5 quintals of feed units per hectare.

During the Tenth Five-Year Plan, more than 6 million hectares of acid soil were limed throughout the republic. Nevertheless, at the present time 53 percent of the arable soils and approximately 40 percent of the haying and pasture land have unfavorable acidity levels. It is for this reason that the annual shortfall in yield amounts to approximately 950,000 tons of feed units.

During this five-year plan, there will be a requirement for applying lime to 5.1 million hectares of land. The carrying out of the mentioned work is characterized by a number of basic peculiarities. This includes expanding the scope of the soils requiring lime applications. A second peculiarity consists of applying higher dosages of lime fertilizers for the purpose of ensuring an optimum soil reaction on the entire area of arable land and improved haying and pasture lands.

Constant concern must be displayed for supplementing the supplies of humus in the soil in every possible way. Rich experience has been accumulated in this regard at the kolkhozes imeni Kirov in Shklovskiy Rayon and Zavety Lenina in Maloritskiy Rayon, where each year 15-20 tons of organic fertilizer are applied per hectare of arable land. This has made it possible to raise the humus content in the arable soils to 2-3 percent, or close to the optimum level.

Many farms have already achieved stable indicators for fertilizer effectiveness. However, for the republic as a whole, the potentially possible return from the use of mineral fertilizer is being realized by only 70-85 percent.

What is the reason for this?

An increase in the resources employed for affecting the land or plants makes the work of an agronomist more complicated. Thus the technology for cultivating crops, taking into account the changing conditions, must undergo changes annually and seasonally. For it is under these modern conditions, with increases taking place in the funds being invested in the land, that the requirements for developing and implementing scientifically sound systems of farming are increasing.

During the next few years, no substantial increase can be expected in fertilizer deliveries. Growth in yields must be achieved through more productive use of each kilogram of fertilizer and by employing a differentiated approach when establishing the dosages, periods and methods for their use. In improving the nitrogen balance of agricultural lands, especially sod-podzolic soils, tremendous importance is attached to leguminous perennial grasses. In the absence of such crops as clover and alfalfa, it is difficult to improve the nitrogen balance of soils or solve the feed protein problem. At the Kolkhoz imeni Voronetskiy in Berestovitskiy Rayon, for example, pulse crops, which occupy 22 percent of the area under crops, are producing a savings of 11 kilograms of nitrogen per hectare of arable land; this nitrogen constitutes a reserve for use on meadow and pasture land. If all of the farms were to achieve this same goal, a reserve of approximately 30,000 tons of nitrogen would become available.

For the establishment of order out on the land and for the purpose of raising the productive strength of each hectare, a special role is played by land reclamation in the broadest sense -- from hydraulic engineering to chemical and cultural-technical measures.

During the years of the Tenth Five-Year Plan, 605,000 hectares of swampy and waterlogged land were placed in operation, irrigation systems were built on an area of 90,000 hectares, a complex of soil improvement operations was carried out on 1 million hectares and roads and dozens of new sovkhozes were built. The productivity of a hectare of reclaimed arable land increased to 34.6 quintals of feed units. During the years of the last three five-year plans the gross production of crop husbandry products, obtained from drained lands, increased by a factor of 3.8. However, tremendous reserves are available here.

Our task consists of applying ourselves in a more strict and exacting manner to the selection of the projects for priority land reclamation and also to the quality of the land reclamation construction work and to the proper use of drained lands. We must inform our agronomic personnel regarding still another important factor associated with raising the productive strength of land. Within the republic there are approximately 2 million hectares of arable land that are subject to water and wind erosion. Each year, an average of approximately 18 tons of soil is eroded from each hectare and 2 tons are borne away by the wind.

Many farms are carrying out a definite amount of work in connection with implementing anti-erosion measures. Autumn non-mouldboard tilling of the soil using sweeps and also regrassing operations are being carried out at the Sovkhoz imeni Ul'yanov in Minskiy Rayon, at the Gorodets Sovkhoz and the Pravda Kolkhoz in Shklovskiy Rayon and at the Kolkhoz imeni Gastello in Korelichskiy Rayon. This work has been in progress for a number of years. As a result, the erosion of the soil has ceased. The experience of these farms must be employed at those kolkhozes and sovkhozes where the soil is subject to erosion.

For the timely completion of soil cultivation work, special importance is attached to the highly productive use of the machine pool during the autumn and spring periods. Thus, maximum use should be made of multiple-purpose units which, in addition to preparing the soil, also carry out such operations as applying mineral fertilizers and sowing grain crops. Their use is important in view of the fact that they reduce the number of passes made by a tractor over a field and this in turn eliminates the danger of excessive packing of the soil.

The republic's most important branch of crop husbandry has been and continues to be the production of grain. During the years of the Tenth Five-Year Plan, grain production at the republic's kolkhozes and sovkhozes increased by 12 percent. The best results were achieved by the farms in Brestskaya Oblast; they fulfilled their grain production plans and raised the cropping power of the grain crops to 24.1 quintals. At the same time, the republic did not fulfill its five-year plans for the production and sale of grain to the state and grain production on farms in Vitebskaya Oblast fell by 3.6 percent.

This year the kolkhozes and sovkhozes are confronted with the task of raising the cropping power of the grain crops to 26-27 quintals and the gross yield -- to 7.6 million tons. The principal means for increasing the production of grain -- intensification of the entire grain economy, the further introduction of highly productive varieties, the efficient use of mineral and organic fertilizers, the further introduction of all elements employed in the progressive technology for cultivating grain crops, the elimination of considerable losses in output during harvesting operations and the conversion over to industrial seed production. Such kolkhozes as the 40 Let Oktyabrya in Ivanovskiy Rayon, Osnezhitskiy in Pinskiy Rayon, imeni Lenin in Tolochinskiy Rayon, imeni XXII S"yezda KPSS in Gomel'skiy Rayon, Progress in Grodnenskiy Rayon, imeni Timiryazev in Kopyl'skiy Rayon, Avangard in Mogilevskiy Rayon, imeni Gastello in Minskiy Rayon and imeni Bogushevich in Beshenkovichskiy Rayon are annually producing from 1,500 to 3,000 tons of grain crop seed. Unfortunately, these examples are still isolated in nature.

The conversion of grain crop seed production over to an industrial basis, in addition to a high culture of farming and skilled work on the part of the specialist seed growers, requires the creation of a modern logistical base at the seed production farms. Meanwhile, the creation of such a base is still proceeding at an extremely low tempo. During the past 4 years, capabilities were placed in operation for only 162,000 tons of seed -- 38 percent of the plan. This underscores the absence of a business-like efficiency in this important matter.

A great amount of experimental material has been accumulated at experimental stations and strain testing stations of BelNIIZ [Belorussian Scientific Research Institute of Farming] in connection with the development and use of agricultural practices for each new variety. Experience accumulated over a period of many years has revealed that strict observance of high quality agricultural practices makes it possible to obtain high and stable yields year after year.

High quality agricultural practices play a decisive role in such a complicated matter as the wintering of the crops, especially during unfavorable years. Thus the agronomic service in the various rayons and at kolkhozes and sovkhozes must expand in every way possible its links with strain testing stations and experimental stations and it must organize experimental work in the various areas, on an extensive scale and in keeping with the example set by the workers in Grodnenskiy Rayon. There must be an experimental field of an agronomist on each farm.

During the past few years, another important problem has arisen at kolkhozes and sovkhozes throughout the republic -- the lodging of grain crop plantings. What can be done to bring a halt to this phenomenon? Science and advanced practice have revealed that plantings lodge to a lesser degree in those areas where organic and mineral fertilizers are applied in a uniform manner and where the agronomists accurately define the sowing norms and take advantage of the achievements of the agricultural science. A large number of farms could be cited which systematically obtain high yields and which are bothered to only a minimal degree by the lodging of crops. This includes such kolkhozes as Svetlyy Put' in Molodechnenskiy Rayon and imeni Gastello in Minskiy Rayon and also the Ust'ye Experimental Base in Orshanskiy Rayon. However, there are still only very few such farms. This situation must be corrected. In addition to agronomic methods, use must also be made of plant growth regulators on an extensive scale for combating the lodging of winter crops.

A weak element in the grain production technology, especially from an organizational standpoint, is the grain harvesting operations. As a rule, the harvesting work commences too early, when the grain bulk has a moisture content of 40 percent or more and lasts two or three times longer than the optimum periods. Thus, crop losses occur in the first instance owing to insufficiently ripe grain; the productivity of the combines decreases since the grain bulk has an extremely high moisture content and the drying and grain cleaning thrashing floors are unable to process it. In such instances the combines often break down and this in turn tends to prolong the harvesting schedules. At the same time, it is a known fact that in the case of rye, wheat and barley, 10 percent of the crop is lost 11 days following the onset of the complete ripeness phase and oat losses for the same period amount to almost 27 percent.

The grain must be cut down when its moisture content is 25-27 percent. Under favorable weather conditions, the two-phase harvesting system produces fine results. It makes it possible to commence the harvest work 4-5 days following the onset of the waxy ripeness phase and it raises the productivity of the combines for picking up the grain bulk.

The intensive use of each hectare of land -- this is the foundation for strengthening the feed base. A great amount of work has been carried out throughout the republic in connection with developing this base. A great amount of experience has been accumulated in obtaining high and stable yields on meadows and in growing forage crops. The kolkhozes imeni Kirov in Slutskiy Rayon, Svetlyy Put' and imeni Lenin in Molodechnenskiy Rayon, the Korelichi Breeding Plant in Korelichskiy Rayon, the Rassvet Kolkhoz in Kirovskiy Rayon and the Kolkhoz imeni Uritskiy in Gomel'skiy Rayon are obtaining more than 7,000 feed units per hectare at a production cost of 2-3 kopecks per feed unit. Each year, 30-35 quintals of feed units per hectare are being obtained from the entire area of improved haying and pasture land in Molodechnenskiy, Lyubanskiy, Kletskiy, Minskiy and Kirovskiy Rayons.

However, the level of development achieved in feed production is still not satisfying the animal husbandry requirements for feed. This is restraining the rates of growth for animal productivity, it is resulting in tremendous feed consumption and it is raising the production costs for the output. In a number of areas, proper attention is not being given to corn and insufficient work is being carried out aimed at raising the productivity of meadows or implementing basic improvements in them.

As a result of these and certain other shortcomings in the work being performed by the agronomists, the cropping power of the forage crops and the productivity of the meadow lands remain low at many kolkhozes and sovkhozes.

We are quite justified in addressing serious claims against the agronomists and farm leaders. What kind of a field technologist is an individual if he fails to carry out his direct official duties with regard to introducing into operations the experience of leading workers and the recommendations of science? The interests of the work persistently require that an evaluation be furnished on the work being performed by kolkhoz and sovkhoz agronomists and leaders, with regard to the productivity levels for all agricultural land and the feed unit yields being obtained from them.

One of the main sources and reserves for increasing the production of full-value and cheap feed in the republic must be that of haying and pasture lands. The republic has considerable areas of flood plain land at its disposal. There are more than 700,000 hectares of such land in the basins of the Dnepr, Sozh, Pripyat', Berezina and Zapadnaya Dvina rivers.

The principal task of the agronomic service and land reclamation organizations this year consists of raising the productivity of these lands sharply by carrying out land reclamation and soil improvement work, by applying mineral and lime fertilizers in the required amounts, through irrigation, by creating the required grass stand and by carrying out regrassing work in a timely manner.

In order to increase the amount of digestible protein, substantial changes must be carried out in the structure of the forage crops themselves. In the silage crop group, the plantings should be expanded in a mixture with pulse crops and the proportion of peas, lupine and vetch in annual crop plantings for silage and green feed must be raised from 33 to 64 percent, alfalfa and clovers in the perennial grass group -- from 35 to 75 percent, mustard family crops in the group of intermediate and secondary sowings -- from 10 to 40 percent.

The protein problem cannot be solved until such times as all of the kolkhozes and sovkhozes are truly engaged in the cultivation of pulse crops and raising their cropping power. By 1985, as called for in the feed production program, the areas used for the cultivation of lupine, peas, maple peas and vetch must be expanded by almost twofold. Subsequently, the sowings of pulse crops and their cropping power must be increased to amounts which will ensure the grain forage structure in the ratio: barley and oats -- 64-65 percent, rye and wheat -- 20 and pulse crops -- 15-16 percent. For such a ratio, there will be 106-107 grams of digestible protein in the grain portion of a ration for each feed unit.

Corn, considered to be the highest energy feed, warrants special mention. Scientific data and leading experience reveal that this crop, on all farms without exception, can furnish a fodder yield of no less than 250-300 quintals per hectare.

The most efficient measure within the overall system of measures for raising the effectiveness of field and meadow feed production is that of implementing radical improvements in seed production for forage crops, especially lupine, peas, vetch, clover and alfalfa and also cereal grasses. The work must be organized in a manner such that the leguminous perennial grasses occupy a worthy place in the crop rotation plans and they should be employed extensively on haying and pasture lands.

One priority task is that of the introduction of modern technologies for the production of feed. A radical change must take place in the attitude of farm specialists and leaders towards hay, with this feed occupying no less than 7 percent of the structure of all feed consumed. There are many examples of a crop which has already been cultivated being lost as a result of poor quality harvesting work or unskilled work in the procurement of hay, haylage and silage.

We must radically improve and enliven the work of organizing feed production as an independent branch, solve this year the problem of having feed specialists in the rayons and at all of the kolkhozes and sovkhozes and create permanent complex feed procurement detachments on the farms.

The republic's largest branch of farming has been and continues to be that of potato production. During the years of the 10th Five-Year Plan, the cropping power of potatoes amounted to 155 quintals per hectare, compared to only 130 during the Ninth Five-Year Plan, and with more than 9 million tons of food potatoes being sold to the state. The republic's favorable weather conditions and also available experience underscore the possibility of obtaining yields for this crop on the order of 250 quintals per hectare at all farms.

The leaders and specialists of farms and rayon agricultural administrations, commencing this year, must devote serious attention to organizing intrafarm seed production and to establishing seed production brigades, such that the cultivation of a variety ends with the fifth reproduction. The principal task during the next few years will be that of converting seed production over to a non-virus basis. This will make it possible to improve sharply the quality of the seed and to raise the cropping power of the potatoes by 10-15 percent.

The problems associated with the production of flax require a great amount of attention. Not one oblast fulfilled its planned tasks for the sale of flax products. Nor is it proper to blame the weather alone for this development. The principal concern here is the fact that the leaders and specialists of many kolkhozes and sovkhozes devoted less attention to the growing of this most important technical crop.

The data of scientific studies and the experience of leading farms reveal that flax fibre yields on the order of 6-7 quintals or more per hectare form in all areas. Each year the kolkhozes imeni Kirov in Shklovskiy Rayon and Pobeda in Baranovichskiy Rayon obtain on the average 1 ton of fibre from each hectare. Even last year, an unfavorable one from the standpoint of weather, the Belarus' Kolkhoz in Lyakhovichskiy Rayon obtained 10.8 quintals, the Kolkhoz imeni Kirov in Shklovskiy Rayon -- 8.5, the Kolkhoz imeni Engel's in Tolochinskiy Rayon -- 8.4 and the Pobeda Kolkhoz in Baranovichskiy Rayon -- 8 quintals of fibre per hectare.

The kolkhozes and sovkhozes in Lyakhovichskiy Rayon fulfilled their plans for the production and sale of fibre not only for last year but also for the Tenth Five-Year Plan on the whole. Last year, a fibre cropping power of 6.1 quintals per hectare was obtained in the rayon and for the five-year plan it amounted to 5.6 quintals. The farms in Iv'yevskiy and Smorgonskiy Rayons are over-fulfilling their five-year plans.

During this new five-year plan, the plans for the production and sale of flax products will remain roughly at the same level for 1980. Our task consists of bringing about a radical change in the attitude towards flax, to strengthen substantially the logistical base of the flax growing kolkhozes and sovkhozes and to raise the quality of the flax raw materials. When this is done, the economic indicators of the branch will improve.

Fine experience in the production of vegetables on an industrial basis is available at the Kadino Sovkhoz in Mogilevskiy Rayon. The agronomic service of the farm, jointly with scientists, has developed an efficient system for carrying out vegetable growing operations. Sectors were selected which are suitable for the growing of green produce and vegetable-feed crop rotation plans with irrigation were organized and also the production of seedlings and seed for vegetable crops. According to their value, the vegetables are placed in the same row with the grain, potatoes and other crops.

Purposeful work is being carried out in the republic in connection with supplying the kolkhozes and sovkhozes with cadres of agronomists, engineers and other specialists. According to the situation on 1 April 1980, there were 6,077 agronomists of all specialties working at the kolkhozes and sovkhozes, 2,900 of whom possessed higher educations. Among the chief agronomists, 68.3 percent presently possess high qualifications.

Fine work is being carried out with regard to improving the quality structure of agronomists on a majority of the farms in Grodnenskaya Oblast, where 60 percent of the specialists possess high qualifications -- 93 percent in the case of the chief agronomists. The posts of chief agronomist have been completely replaced by specialists possessing high qualifications in Grodnenskiy, Dyatlovskiy, Zel'venskiy, Korelichskiy, Novogrudskiy, Oshmyanskiy and a number of other rayons. During the years of the 10th Five-Year Plan, 7,600 middle echelon agronomists and leaders improved their qualifications through various training forms.

The republic now has a large number of agronomists possessing high qualifications, individuals who have mastered the leading production methods and who have raised the role they play as technologists and organizers of agricultural production.

In our republic, just as throughout the country as a whole, a single agronomic service has been created. It must be organically associated with each kolkhoz and sovkhoz. Extreme importance is attached to ensuring that the farm agronomists and agronomic service specialists establish close contacts and operate jointly in the interests of kolkhoz and sovkhoz production and also for the purpose of raising the cropping power.

At the present time, in conformity with the decisions handed down during the July (1978) Plenum of the CC CPSU, measures have been developed for improving planning and stimulating agricultural production throughout the country. First of all, the plans call for the elimination of excessive guardianship over the farms and their leaders and for providing them with greater independence. The system for awarding bonuses to leaders and specialists is being changed and the wages being paid to farmers and livestock breeders are being coordinated more closely with the final results. Here we have in mind the need for making more active use of economic methods, the job contract plus bonus system and other progressive forms of payments.

At the same time, the new system for planning and stimulation imposes special responsibility upon our personnel. Indeed the kolkhozes and sovkhozes must take the new developments into account when preparing their production-financial plans for 1981 and the Eleventh Five-Year Plan. The new system is creating a climate wherein each rural worker participates actively not only in developing the future prospects for his farm, but in addition he strives industriously to carry them out.

A maximum amount of attention must be given to those problems concerned with the organization of spring field work, staffing the teams and detachments, their work methods depending upon the specific conditions and the availability of machine operators. The experience of farms in Kormyanskiy, Volkovyskiy and other rayons, which have operated their equipment on a continuous basis and which regularly have provided their machine operators with days off, must be supported and disseminated on an extensive scale.

The exemplary carrying out of all of the agrochemical measures and timely and high quality preparations for the sowing operations serve to guarantee that high yields will be obtained and all socialist obligations fulfilled.

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## TILLING AND CROPPING TECHNOLOGY

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# PROBLEMS OF INCREASING SOIL FERTILITY IN NONCHERNOZEM ZONE

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[Text] The diversity of natural conditions in the nonchernozem zone of the RSFSR requires a regionally differentiated approach to the solution of all problems of reclamation and a rational utilization of and increase in the fertility of soil. This article examines problems of reclamation, liming and fertilization of soil, balancing of food elements and humus in it, improvement in physical properties and a fuller utilization of soil and climatic resources through an improvement in the structure of sown areas and crop rotations, introduction of mixed sowing of agricultural plants with a tier arrangement of leaves and root systems and protection of soil against erosion and pollution.

"Basic Trends in the Economic and Social Development of the USSR for 1981-1985 and for the Period Until 1990" set the task of improving the distribution of agricultural production throughout the country's zones and regions and maximally increasing soil fertility and the yield of crops on the basis of the use of scientifically substantiated systems of economic management. Much attention is paid to the nonchernozem zone of the RSFSR. It is considered necessary to continue the implementation of the overall program for the transformation of this zone into a region of highly productive farming and animal husbandry.

Examining problems of increasing the fertility of soil in the nonchernozem zone and its rational utilization, it is first of all necessary to stress that from the natural soil and climatic standpoint its territory is extremely diverse. Many natural boundaries pass there, that is, between frigid and temperate thermal zones, tundras and forest tundras, coniferous and mixed forests and broad-leaf forests and meadow steppes of the forest steppe zone. The nonchernozem zone is very diversified in the nature of the relief, genesis and lithology of soil forming rocks, river drainage and hydrological conditions. In accordance with the diversity of natural conditions of soil formation the soil cover of the nonchernozem zone--the main means of production in agriculture--is also extremely nonuniform.

The following zones are singled out in the scheme of soil regionalization of the nonchernozem area: polar, forest tundra-northern taiga, central taiga and southern taiga subzones and forest steppe and mountain zones, each of which is characterized by a special type of soil (table 1). Furthermore, these zones in turn are subdivided into soil provinces, districts and regions differing in the composition and structure of the soil cover, nature of the relief and soil forming rocks, mechanical composition, chemical and biological soil properties and, therefore, fertility level as well (1).

Investigations conducted in the last few years have shown that the territorial differentiation of the normative indicators of expenditures and results of agricultural production should be made not only according to soil and climatic zones, but natural agricultural districts and regions as well. This is connected with the fact that the nature of the structure of the soil cover and of the relief of an area forming the basis for the singling out of districts and regions determines the significant differences in land fertility and in the technology of agricultural production even within the same soil and climatic zone (2). The specific nature and diversity of natural conditions in the nonchernozem zone require a clearly differentiated approach to the planning and implementation of any measures for the development and utilization of land resources (3).

In natural biogeocenoses soil and the plant cover are closely connected and interdependent. When virgin soil is drawn into agricultural production, this natural dynamic balance in biogeocenoses is disturbed.

Cultivated plants, especially their highly productive varieties, are very demanding on soil conditions and almost all of them grow poorly, or not at all, on acid or alkaline, waterlogged or saline soil. The properties of all natural soil, even such rich soil as chernozem formed under grassy plants, do not correspond to the biological properties of cultivated plants. They must be changed--brought into conformity with the high requirements and biological properties of cultivated plants. In order to ensure such a change in soil, an orderly system of measures of effect on it and on the nature of its biological activity and an overall, system approach to an increase in its fertility are needed.

For different regions and different types of soil in the nonchernozem zone the set of measures for a directed improvement in its properties and for its cultivation should be different and take into account primarily the properties unfavorable for cultivated plants that limit the harvest. Considerable swampiness of the territory and waterlogging of soil are the characteristic features of most of the land resources of this zone. Reclamation is the main way of overcoming these negative qualities of the soil cover.

Swampy, marshy and waterlogged soil in the nonchernozem zone differs in its properties, regimes and causes of swampiness. This fact should be fully taken into consideration. Therefore, reclamation planning is based on the data of overall soil and ecological research (4).

Table 1. Distribution of Land Resources of the Nonchernozem Zone Throughout Natural Zones

| Природные зоны и преобладающие почвы (1) | (2) Общая площадь | | (3) Сельскохозяйственные угодья* | | | | | | | | (8) Лес % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (4) всего | | (5) пашня | | (6) сенокосы | | (7) пастбища | | |
| | тыс. га (9) | % | тыс. га (9) | % | тыс. га (9) | % | тыс. га (9) | % | тыс. га (9) | % | |
| Полярнотундровая: (10) | | | | | | | | | | | |
| тундрово-глеевые, тундрово-болотные почвы (11) | 26368,2 | 9,3 | 59.7 | 0.2 | 4,2 | 0,01 | 33.1 | 0.1 | 201.7 | 0.1 | 0.8 |
| Лесотундрово-северотаежная: (12) | | | | | | | | | | | |
| болотно-подзолистые, болотные, глеево-подзолистые и подзолистые почвы (13) | 70351.4 | 24,9 | 577,3 | 0,8 | 71,1 | 0,1 | 376.0 | 0.5 | 32103,9 | 0.2 | 45.6 |
| Среднетаежная: (14) | | | | | | | | | | | |
| подзолистые, болотно-подзолистые и болотные почвы (15) | 51270,5 | 18,1 | 2926,3 | 5,8 | 965,1 | 1,9 | 1190,5 | 2,3 | 39204,8 | 1,4 | 76,4 |
| Южнотаежная: (16) | | | | | | | | | | | |
| (17) дерново-подзолистые, болотно-подзолистые и болотные почвы | 98804.5 | 34,9 | 33036,6 | 33,4 | 19327,4 | 19,6 | 6985,6 | 7,1 | 48872,0 | 5,7 | 49,5 |
| (18) Лиственно-лесная и лесостепная: | | | | | | | | | | | |
| серые лесные, лесостепные черноземы и дерново-подзолистые почвы (19) | 22753,4 | 8,0 | 13765,0 | 60,5 | 10462,1 | 46,0 | 1390,5 | 6,1 | 7028,2 | 8,0 | 30,9 |
| Горный Урал: (20) | | | | | | | | | | | |
| горные подзолистые и болотно-подзолистые почвы (21) | 13537,9 | 4,8 | 331,7 | 2,5 | 71,5 | 0,5 | 173,6 | 1,3 | 10208,4 | 0,6 | 75,4 |
| Всего (4) | 283085,9 | 100,0 | 50696,3 | 17,9 | 30901,4 | 10,9 | 10149,3 | 3,6 | 137615,0 | 2,9 | 48,6 |

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*Agricultural land and forests are given in percent of the area of natural zones. The table was compiled according to the data of the book "Prirodno-Khozyaystvennoye Rayonirovaniye Zemel'nogo Fonda SSSR" /Natural-Economic Regionalization of Land Resources in the USSR/, Moscow, 1975.

/Key on following page/

Key to table 1:

1. Natural zones and prevailing soil
2. Total area
3. Agricultural land
4. Total
5. Arable land
6. Hayfields
7. Pastures
8. Forests
9. Thousand hectares
10. Polar tundra zone
11. Gley tundra and swampy tundra soil
12. Forest tundra-northern taiga zone
13. Swampy-podzolic, swampy, gley podzolic and podzolic soil
14. Central taiga zone
15. Podzolic, swampy-podzolic and swampy soil
16. Southern taiga zone
17. Soddy-podzolic, swampy-podzolic and swampy soil
18. Leaf-forest and forest steppe zone
19. Grey forest and forest steppe chernozem and soddy podzolic soil
20. Mountain Ural zone
21. Mountain podzolic and swampy-podzolic soil

Podzolic soil is prevalent in the nonchernozem zone (table 1). The main unfavorable properties of this type of soil include its acid reaction (pH 4.5-4.0 and lower), presence of toxic aluminum and manganese compounds and toxic microorganisms, prolonged seasonal waterlogging caused by the predominance of precipitation over evaporation, dispersed structure and unfavorable water and physical properties of the arable layer, low biological activity and shortage of food elements in a form available to plants connected with this, low content of humus and its unfavorable qualitative composition and close occurrence of the podzolic eluvial horizon with unfavorable properties.

Let us examine these characteristics. Despite the fact that podzolic soil is in a sufficiently wet zone, the water regime of this type of poorly cultivated soil is unfavorable for cultivated plants. In fall and, especially, in spring soil remains waterlogged for a long time and at the beginning of summer, when the harvest is formed, its structureless arable layer often dries up and plants are short of water. In case of waterlogging anaerobic, gley processes develop in soil. They have an unfavorable effect on a number of its properties and, in particular, contribute to the formation of mobile and aggressive fulvic acids in soil. Experiments show that even brief waterlogging of podzolic soil is not without a trace. For example, 20-day waterlogging of soil with its subsequent drying and utilization in a vegetative experiment lowered the harvest of sugar beets and barley by 56 percent (5).

The podzolic types of soil includes many sandy loam and sandy varieties, which contain not enough humus and food elements, including magnesium and boron, and possess a low absorptive power and buffer action. Organic fertilizers are quickly mineralized in them and mineral fertilizers and atmospheric precipitation with a low absorptive power and good water permeability are not fixed in the upper strata. Their low buffer action causes a considerable shift in the reaction of soil during the application of physiologically acid mineral fertilizers, which has a negative effect on plant growth. A systematic application of physiologically acid mineral fertilizers (and such forms of fertilizers still predominate) to soil in time does not increase, but, conversely, can decrease plant harvests. This is connected with the fact that acid fertilizers applied without lime, enriching soil with food elements, at the same time, impair the properties of podzolic soil, which are bad as it is (6). For example, an annual application of 60 kg of ammonium sulfate per hectare to acid, poorly cultivated soil in 3 years led even to a decrease in the potato harvest (7).

Gley tundra and gley podzolic soil in the zone's northern oblasts is also heavily waterlogged and has an acid reaction and unfavorable physical, agrochemical and biological properties like all podzolic soil. Furthermore, this soil needs heat reclamation. Grey forest soil is also not saturated with bases and has an acid reaction and other unfavorable properties characteristic of podzolic soil, but these properties are less pronounced in it, especially when passing from light grey to grey and dark grey forest soil.

Peat bog soil occupies large areas in the northwestern part of the nonchernozem zone. The reclamation and cultivation of this soil make it possible to somewhat expand the areas of arable land and to obtain high harvests of many agricultural crops on them. At the same time, regulation of the level of soil water, rates of peat mineralization and the ratio of food elements in soil is of great importance. One-sided drainage of peat soil at a significant depth, without the possibility of raising the level of ground soil water, leads to overdrying of the root layer during a dry summer period and to excessive peat mineralization and creates an unbalanced nutritive regime (8).

In the southern part of the nonchernozem zone (Orlovskaya, Ryazanskaya and Tul'skaya oblasts) there is soil of the chernozem type. Despite the big reserves of humus and food elements and, on the whole, favorable properties, it also needs cultivation in order to meet the needs of cultivated plants, because the reserves of food elements in a form available for plants in agrocenoses should be higher than in natural biocenoses. For example, agrocenoses on chernozem with harvests at the level of strain testing plots consume 160 to 250 kg of nitrogen per hectare and 625 to 800 kg of ash elements per hectare (9, 10) and natural grass phytocenoses, 130 to 150 and 400 to 600 respectively (11). On virgin chernozem the fertility and number of microorganisms participating in the transformation of food elements, including the oligonitrophilic group, are lower than in the arable layer of chernozem (12).

Enumerating the most important properties of soil in the nonchernozem zone unfavorable for cultivated plants, we must not fail to discuss a property common for all arable soil--so-called soil exhaustion. Among the causes of soil exhaustion the following can be singled out: controlled causes (one-sided removal of food elements, shift in pH and development of some diseases) and causes hard to control or not controlled at all (development of phytopathogenic microflora, one-sided development of some groups of microorganisms to the detriment of others and accumulation of phytotoxins in soil). All these factors can have a direct toxic effect on plants, or indirectly stimulate the development of toxic microorganisms (13). For example, it has been found that oat roots secrete inhibiting substances close to coumarin into soil and flax roots, toxic aromatic compounds (14). The toxins of the nematode faun[illegible] root rot have a very negative effect on the harvest of cultivated plants.

The unfavorable properties of soil in the nonchernozem zone enumerated above are the basic cause of the production of still low harvests on developed, but poorly cultivated, soil on a number of farms (15). However, high harvests can be obtained on well cultivated soil (table 2).

Table 2. Productivity of Plants Depending on the Degree of Soil Cultivation, quintals per hectare (according to 15)

| Crop | Well Cultivated Soil | Poorly Cultivated Soil |
|---|---|---|
| Sugar beets | 343 | 11.7 |
| Corn | 427 | 20.0 |
| Fodder beans (grain) | 19 | 2.8 |
| Potatoes | 274 | 93.0 |
| Clover | 70 | 0 |
| Oats | 24.3 | 12.2 |
| Lupin | 250 | 25.0 |

We will note the most important ways of cultivating soil in the nonchernozem zone. Along with fundamental soil reclamation the liming of acid soil should be mentioned as the first in importance and order. As is well known, a neutral or weakly acid reaction is optimal for most cultivated plants. When pH is above 4.5, the toxic forms of aluminum disappear and the number of toxic microorganisms is lowered. Therefore, neutralization of soil acidity in itself sharply increases the harvest. Furthermore, the effectiveness of all other methods of soil cultivation depends on it. A large quantity of soil calcium and lime is washed away with the flow of soil water and is also removed with the harvests of agricultural crops. At the same time, there is a constant shift in the reaction of soil toward the acid side. For example, under the conditions of the Tatar ASSR, on the average, in a year soddy-podzolic and light grey forest soil is acidified 0.20, grey and dark grey forest soil, 0.19 and leached and podzolized chernozem, 0.18 meq per 100 grams of soil (16). This points to the need for "maintenance" liming in small doses not only of acid soil, but soil saturated with bases--chernozem--as well. The effectiveness of application of small doses of lime to the latter was confirmed by field experiments a long time ago (17). Considering the great need of many areas of the national economy for lime, the task of agricultural science includes a search for and testing of the waste of industry and mining enterprises suitable for liming, as well as development of methods of the most rational utilization of lime materials.

Maintenance of a deficit-free balance and accumulation of humus in soil are other very important and effective methods of soil cultivation. The development of useful microorganisms in soil, formation of soil properties favorable for plants and increase in soil fertility are closely connected with them. In addition to manure, peat and various composts, the sowing of perennial grass and green manure crops are used for this purpose. The sowing of lupin for green manuring is effective on sandy soil. Under the conditions of specialization of agricultural production and when crop rotations are saturated with grain and row crops the sowing of catch crops, which are turned under soil, is an important source of organic substance. This method is still used very little, although for the conditions of the central and southern taiga regions of the nonchernozem zone there are many catch crops forming a large root system and ground mass (white mustard, rape and so forth) in a short time.

When soil is cultivated, the removal of plant food elements is compensated by fertilizers. The task of their rational utilization--refinement of the methods of determining the needs of plants for them under specific growth conditions and of the techniques and ways of applying fertilizers and increase in the coefficient of their utilization by plants, which is still extremely low (50 to 70 percent of nitrogen and potassium fertilizers and about 25 percent of phosphorus fertilizers)--remains urgent today. The problem of accumulation of "biological" nitrogen--nitrogen of the atmosphere assimilated by organisms--in soil remains exceptionally important.

The conservation and creation of a water stable and porous structure and decrease in the balance density of the arable layer of soil to the optimum level play an important role in an improvement in the properties and increase in the fertility of soil in the nonchernozem zone. This creates a water and air regime favorable for cultivated plants, increases the biological activity of soil and reduces seasonal waterlogging, with which the development of unfavorable anaerobic processes is connected. The sowing of perennial grass and application of organic and calcium-containing fertilizers and reclamation agents are the basic methods of soil structurization. Minimalization of mechanical soil cultivation and reduction in the number of passages of tractors and agricultural implements contribute to the conservation of structure.

The control of soil erosion also pertains to major measures for the protection and increase in the fertility of soil not only in the meadow forest steppe part of the nonchernozem zone, but in the taiga-forest zone as well, where it was underestimated in connection with the fact that arable land in this zone is located in the vicinity of forest tracts. For example, in Smolenskaya Oblast, as a result of the erosion of the upper soil layer and the loss of humus, nitrogen and other plant food elements, the harvest of crops on eroded soil is lowered by a factor of 1.5 to 2 (18). In this problem main attention should be drawn to the elimination of the causes of water erosion--flow from watershed spaces and upper parts of slopes--and then to the elimination of the consequences of erosion, basically through the entire set of soil cultivation measures.

An infertile podzolic horizon occurs in podzolic soil close to the surface, which causes its gradual inclusion in the arable layer with a simultaneous application of organic fertilizers and lime and implementation of measures for the structurization of the arable layer. Therefore, tier tilling with hoeing and a gradual inclusion of the illuvial horizon of this soil in the arable layer is advisable.

In addition to the soil cultivation measures enumerated above and the application of herbicides and pesticides, the cultivation of crops in crop rotation is the most effective means of controlling soil exhaustion. Increases in the harvests of grain crops in crop rotation depending on the fertilizer background reach 50 to 60 percent and more (19).

The entire set of the enumerated measures for the cultivation of soil (as well as each measure separately) should be utilized with due regard for its specific properties determined both by soil provinces and climatic conditions and the biological characteristics of the species and varieties of agricultural plants. The measures for an increase in agricultural output per unit of arable land include the following: First, improvement in the structure of sown areas with the utilization of the most productive species and varieties of plants with due regard for local soil and climatic conditions and farm specialization. Attention is drawn to this, because arable soil is still utilized often for the sowing of species and varieties of cultivated plants different in productivity, including not very productive. Often all attention, equipment and fertilizers are concentrated on the sowing of leading agricultural crops, their yield and output are calculated by the state and the remaining arable area is utilized for undemanding and, as a rule, not very productive, crops. When the most productive plants are selected, the recommendations of strain testing plots located near farms are used. However, it is necessary to more widely conduct investigations of the evaluation of the suitability of all soil plots for certain crops, as was done, for example, in Belorussia (20). Second, the maximum utilization of physiologically active radiation by crops as a result of an optimum density and placement of plants on the sown area and the use of mixed and companion crops with a tier arrangement of leaves and root systems. Usually, in agrocenoses, in contrast to natural cenoses, the plant stand is often unjustifiably thinner (21). As a rule, there is no sufficient tier structure of the ground mass (leaves) and root systems (various plants), which makes it possible to most fully utilize soil fertility and solar energy. Third, the utilization of soil and agroclimatic resources throughout the warm period of the year. The fact that soil in agrocenoses before the sowing and after the harvesting of a crop is usually not utilized for the production of agricultural products shows how important this reserve is. There are many late crops (on the average, about 40 percent of the warm period is not utilized).

"Basic Trends in the Economic and Social Development of the USSR for 1981 and the Period Until 1990" envisage an average annual increase of 12 to 14 percent in total agricultural output. The fulfillment of this task is possible only on the basis of a significant increase in soil productivity, that is, increase in agricultural output per unit of area (because an expansion of the area of arable land at the expense of virgin land is very limited).

To evaluate the actual productivity of soil under specific conditions of management of agricultural production and to detect the possibilities and ways of increasing it, it is advisable to determine agricultural output (fodder units and protein) per unit of area of arable soil for land use (from 100 or 1 hectare), taking into consideration the output and sown area of all crops forming the structure of sown areas (22). At the same time, it should be taken into consideration that plant residues (surface residues and roots) are economically useful. This is the basic source of organic substance for maintaining and increasing soil fertility. The mass of plant residues can be determined according to the harvest of the basic output of a crop (23). It should be stressed that the productivity of soil in agrocenoses is not equivalent to its fertility. It depends not only on the cultivation and fertility of soil, but also on how rationally and fully soil fertility and solar energy are utilized in agrocenoses. An increase in soil fertility is only the possibility of raising agricultural output, but it is also important how this possibility is implemented.

Table 3 Indicators of Soil Productivity in Various Oblasts of the Nonchernozem Zone (According to 24)

| (1) Область | (2) Фитомасса, ц/га | | | (3) КПИ* ФАР % | Выход кормовых единиц, ц/га | | | (4) Выход белка, ц/га | | | Продуктивность корм. ед. основной продукции (5) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (11) в том числе в продукции | | | (11) в том числе в продукции | | | |
| | общая (6) | отчуждается (7) | растительные остатки (8) | (9) | всего (10) | основной (12) | побочной (13) | всего (10) | основной (12) | побочной (13) | потенциальная на уровне сортоучастков, ц/га (14) | фактическая, % от потенциальной (15) |
| (16) Вологодская | 49.3 | 26.0 | 23.3 | 0.70 | 17.3 | 14.2 | 3.1 | 1.57 | 1.10 | 0.47 | 26.4 | 54 |
| (17) Ленинградская | 84.4 | 44.7 | 39.7 | 1.33 | 27.5 | 23.8 | 3.7 | 3.21 | 2.49 | 0.72 | 26.7 | [illegible] |
| (18) Костромская | 50.3 | 25.7 | 24.8 | 0.67 | 14.6 | 11.6 | 3.0 | 1.65 | 1.19 | 0.46 | 30.0 | 38 |
| (19) Московская | 89.6 | 50.6 | 39.0 | 1.12 | 30.8 | 25.5 | 5.3 | 3.43 | 2.57 | 0.86 | 34.8 | 73 |
| (20) Кировская | 47.7 | 24.3 | 23.4 | 0.61 | 14.8 | 11.6 | 3.2 | 1.58 | 1.16 | 0.42 | 28.8 | 40 |
| (21) Чувашская АССР | 80.9 | 47.5 | 33.4 | 1.03 | 30.1 | 23.8 | 6.3 | 3.36 | 2.35 | 1.01 | 31.7 | 75 |
| (22) Пермская | 56.0 | 28.9 | 27.1 | 0.78 | 17.1 | 13.5 | 3.6 | 2.02 | 1.48 | 0.54 | 27.2 | 50 |

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*KPI--efficiency

Key:

1. Oblast
2. Phytomass, quintals per hectare
3. Yield of fodder units, quintals per hectare
4. Yield of protein, quintals per hectare
5. Productivity of fodder units of basic output
6. Overall
7. Is alienated
8. Plant residues
9. Efficiency of physiologically active radiation
10. Total
11. Including in output
12. Basic
13. Secondary
14. Potential productivity at the level of strain testing plots, quintals per hectare
15. Actual productivity, % of potential productivity
16. Vologodskaya
17. Leningradskaya
18. Kostromskaya
19. Moskovskaya
20. Kirovskaya
21. Chuvashskaya ASSR
22. Permskaya

The results of the determination of the bioproductivity of arable soil in a number of oblasts in the nonchernozem zone by the end of the Ninth Five-Year Plan are presented in table 3. As can be seen from the data in the table, the yield of the overall phytomass totaled from 44.7 to 89.6 quintals per hectare and the yield of fodder units and protein in basic output, from 14 to 30.8 and from 1.58 to 3.40 quintals per hectare of arable soil. Only from 0.65 to 1.33 percent of physiologically active radiation is utilized during a period with a temperature above 10°C. The average mass of plant residues entering soil ranged from 23.4 to 39.0 quintals per hectare, which, the average coefficient of their humification being about 0.2, corresponds to an annual formation of 4.7 to 7.8 quintals of humus per hectare.

The highest indicators of soil productivity are noted in Moskovskaya, Leningradskaya and Kaliningradskaya oblasts and in the Karel'skaya and Chuvashskaya ASSR and some indicators of soil productivity, in Murmanskaya Oblast as well (24). In these oblasts, including on a small area of arable land in northern regions, large doses of organic and mineral fertilizers are applied and the level of agricultural technology and soil cultivation are high. The fact that oblasts with high indicators of soil productivity are located in different zones of the nonchernozem area points to the smoothing of the genetic differences of soil with high agricultural technology and at the level of well-cultivated soil. This can also be seen from the data in table 4, in which the productivity of arable land in oblasts with soil of the podzolic type and in oblasts with dark grey soil and chernozem is compared. Long-term data show that the yield of many crops in northern oblasts is higher than in southern oblasts. Perhaps the great length of the day plays an important role on the highly productive soil in northern oblasts and hence the higher efficiency of physiologically active radiation and the high relative (in percent of the potential) productivity of soil.

A number of farms and oblasts, in particular in Moskovskaya Oblast, right now obtain high harvests on large areas with a relatively high efficiency of physiologically active radiation, which in case of high agricultural technology can be increased to 3 or 5 percent (25). This confirms the real possibility of considerably increasing the productivity of soil in the nonchernozem zone. Calculations show that with the harvests obtained on strain testing plots at the end of the Ninth Five-Year Plan the efficiency of physiologically active radiation in Severo-Zapadnyy, Tsentral'nyy and Volgo-Vyatskiy regions, on the average, increases to 1.4 or 2.2, the yield of fodder units in the basic output of cultivated plants, to 31 or 36 quintals per hectare and the yield of protein, to 3.51 or 4.22 quintals of arable soil per hectare.

There are other problems, which are especially important under the conditions of the nonchernozem zone, that is, protection of soil against chemical pollution, careful attitude toward the resources of agricultural land and recultivation of disturbed land. The importance of these problems was often pointed out in party and government decrees on problems of agricultural development and they have again been confirmed in "Basic Trends in the Economic and Social Development of the USSR for 1981-1985 and for the Period Until 1990." The central regions of this zone represent the most densely populated industrial part of the USSR territory with a big technogenic load. The growth of the population in cities and workers' settlements, construction of industrial and agroindustrial projects, main transport lines and underground and ground utilities and extraction of minerals inevitably lead to the alienation of land and reduction in the per-capita area of arable soil. The area of natural phytocenoses--forest and meadow phytocenoses--is reduced for the same reason. The development of gully erosion, the large area of peat fields and of land that as yet has not been recultivated, inefficient management of forestry and so forth also reduce their area.

Table 4. Yield of Various Agricultural Crops and Bioproductivity of Soil in the Nonchernozem Zone Under the Effect of the Level of Agricultural Technology (According to 24)

| (1) Область | (2) Внесено удобрений | | | | (3) Урожайность культур, ц/га | | | | (4) Показатели биопродуктивности почв, ц/га | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (5) навоз, т/га | (6) минеральных, кг/га | | | (7) зерновые | (8) картофель | (9) однолетних трав | (10) многолетних трав | (11) общая фитомасса | (12) выход | |
| | | N | $P_2O_5$ | $K_2O$ | | | | | | (13) корм. ед. | (14) белка |
| (15) Мурманская | 14,2 | 78 | 46 | 49 | — | 194 | 30.8 | 19,4 | 65.1 | 27.5 | 2,95 |
| (16) Карельская АССР | 10,0 | 89 | 36 | 75 | 26.0 | 172 | 26.7 | 26,1 | 71.7 | 23,5 | 2,35 |
| (17) Московская | 8,3 | 100 | 76 | 28 | 25.3 | 81 | 22.7 | 41,1 | 89.6 | 30.8 | 3,43 |
| (18) Орловская | 1,5 | 27 | 12 | 14 | 14.7 | 98 | 21.2 | 22,1 | 58,5 | 21,6 | 1,88 |
| (19) Тульская | 2,1 | 39 | 21 | 19 | 18,2 | 62 | 20,2 | 23,1 | 63,7 | 23,1 | 2,35 |

Key:

| | | | |
|---|---|---|---|
| 1. | Oblast | 10. | Perennial grass |
| 2. | Fertilizers applied | 11. | Overall phytomass |
| 3. | Yield of crops, quintals per hectare | 12. | Yield |
| 4. | Indicators of soil bioproductivity, quintals per hectare | 13. | Of fodder units |
| 5. | Manure, tons per hectare | 14. | Of protein |
| 6. | Mineral fertilizers, kg per hectare | 15. | Murmanskaya |
| 7. | Grain crops | 16. | Karel'skaya ASSR |
| 8. | Potatoes | 17. | Moskovskaya |
| 9. | Annual grass | 18. | Orlovskaya |
| | | 19. | Tul'skaya |

With a change in the area of soil covered by plants the ecological balance in the biosphere is disturbed, because plants are powerful consumers of carbon dioxide and suppliers of oxygen to the atmosphere. At the same time, the soil-plant system performs the function of creation of an organic substance on dry land and its destruction with a subsequent involvement in new cycles of biological metabolism. The preservation and regulation of this role of soil and of the vegetation covering it and, at the same time, of the animals and microorganisms living in soil are some of the most important tasks in the protection of man's natural environment.

In this connection it is appropriate to mention that "... we, builders of communism, must approach agriculture from another point of view--environmental protection" (L. I. Brezhnev, "Leninskim Kursom" [Following Lenin's Policy], 1976, Vol 5, p 508). This thought of L. I. Brezhnev, which was expressed at the 25th CPSU Congress, was further developed in "Basic Trends in the Economic and Social Development of the USSR for 1981-1985 and for the Period Until 1990," where the section "Protection of Nature" states the following: "It is necessary to improve the protection of nature, to intensify the work on the preservation of agricultural land and the control of its erosion, to increase the rates of land recultivation and to ensure its protection against mud streams, landslides, avalanches, salinization, swampiness, underflooding and dessication."

An analysis and generalization of the data of investigations of the natural conditions of the nonchernozem zone, including its soil and climatic resources, makes it possible to conclude that this vast and important region of our country has favorable possibilities for an intensive development of agriculture. It is especially important to stress that farming and plant growing in this zone can have a fully stable nature, because there are no periodic droughts, which often affect vast regions of chernozem and dry steppe zones, in this zone. Academician D. N. Pryanishkov rightly drew attention to this at one time (26). However, in order that the potentials for the development of agriculture in the nonchernozem zone may be realized, there is a need for an overall and regionally differentiated approach to all problems of reclamation and efficient utilization of soil and increase in and protection of its fertility. The experience of scientific institutions and advanced farms shows that the observance of these conditions makes it possible to double or triple the yield of most grain, vegetable, fodder and industrial crops in this zone. The attainment of such results will make it possible to make an important contribution to the solution of the food program of the 11th Five-Year Plan for the development of the USSR national economy.

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# TILLING AND CROPPING TECHNOLOGY

## EXPANSION OF CHEMIZATION SERVICES ADVOCATED

Moscow SEL'SKAYA ZHIZN' in Russian 21 Apr 81 p 1

[Editorial article: "Chemization and the Harvest"]

[Text] One of the most important factors in the growth of soil fertility and in achieving large and stable harvests is the chemization of agricultural production. The "Basic Directions of Economic and Social Development in the USSR," which were confirmed by the 26th CPSU Congress, foresee an increase in supplies of mineral fertilizers and the means of plant protection, point to the necessity of increasing the role of the agrochemical service and of strengthening its responsibility for the effectiveness of the fertilizer that is utilized. It is planned to introduce local methods of fertilizer application and to sharply decrease fertilizer losses during storage, shipment and use.

The resolution of the CPSU Central Committee and the USSR Council of Ministers, "On Measures to Strengthen the Material and Technical Base of the Agrochemical Service and to Increase the Effectiveness of the Chemization of Agriculture in 1981-1985," which was published recently, is directed at the continued intensification of farming and at providing farming with stability. This important document indicates a complex program for the development of the production base for the Soyuzsel'khozkhimiya [All-Union Agricultural Chemical Association] association system, for kolkhozes, sovkhozes and other agricultural enterprises, a curtailment of fertilizer losses on this bases and an increase in return on fertilizer use. It is planned to build and introduce into operation a large number of storehouses for storing chemical products and points for the technical servicing of tractors, trucks and other vehicles, to equip the associations of Sel'khozkhimiya with highly productive specialized technology and trained cadres and to improve wages. In fervently supporting the measures of the party and state, the agrochemists are multiplying their efforts in the struggle to fulfill their obligations. Working hand in hand with farmers, they have been called upon to make a worthy contribution toward the development of the agroindustrial complex in this country.

It is difficult to overestimate the importance of chemization for the continued growth of productivity of agricultural crops. According to scientific calculations, 1 kilogram of active substance in mineral fertilizers applied in the optimal doses results in an increase of 6-8 kilograms of winter wheat, corn--8-10 kilograms, sugar beets--30-40 and potatoes--28-30. During the first year of the new five-year plan alone industry will supply kolkhozes and sovkhozes with over 20.3 million tons of such elements of fertility. This is why it is so important to utilize fertilizer economically, to make sure that each kilogram yields a high return and the maximum quantity of agricultural products and raw materials.

This problem must be dealt with by a single specialized agrochemical service, Soyuzsel'khozkhimiya. Its local subdivisions must be completely responsible for the scientifically-based and effective use of fertilizers, meliorative agents and agents for plant protection. One and a half years have passed since the organization of the new service. There are local scientific-production and territorial associations, agrochemical laboratories and stations for plant protection. Chemization workers are becoming dependable allies of farmers in the struggle for a large harvest.

This is precisely the way things are in Pervomayskiy Rayon of Khar'kovskaya Oblast. The single agrochemical complex that was created here has introduced the industrial technology of receiving, storing, preparing and applying all types of fertilizers to the fields of kolkhozes and sovkhozes. Five years of operations by the complex have confirmed the correctness of the selected direction. The average productivity of grain crops in the rayon has increased from 24.1 quintals per hectare during the Ninth Five-Year Plan to 30.7 in the 10th; of sugar beets--from 195 to 313 quintals respectively. All economic indicators in the enterprises have improved noticeably. This valuable experience, which was approved by the CPSU Central Committee, was recently described in SEL'SKAYA ZHIZN' and is being copied widely.

The clear organization of the chemical service is having a favorable effect on the growth of productivity of Belorussian lands. The productivity of grains here has increased by 8.2 quintals per hectare; of potatoes--by 37. In fulfilling the decisions of the 26th CPSU Congress, the workers of Belorussian fields have pledged to harvest 26-27 quintals of grain per hectare and to significantly increase the production and procurement of all types of agricultural products and raw materials. The detachments of Sel'khozkhimiya are applying mineral fertilizers for the new harvest and they have already provided over 50 million tons of organic fertilizers. Noteworthy work to increase soil fertility is being conducted in Moldavia, the Kirghiz SSR, Krasnodarskiy Kray and Ul'yanovskaya Oblast. This type of work must be performed consistently everywhere.

Today there is no more important and responsible goal than the creation in the spring of a dependable foundation for a large harvest during the first year of the five-year plan. The availability of fertilizers enables us to complete the top-dressing of all winter crops and to apply the required quantity of mineral fertilizers in the soil during spring sowing. We must give the green light to mineral fertilizers all along the road from the plant to the field. We must prepare them well and use them on a strictly scientific basis.

Organic fertilizer is a huge reserve for farming. The Belorussian kolkhozes imeni Gastello, Novyy Byt, imeni Kalinin and Osnezhitskiy annually apply up to 20 tons of organic fertilizer per hectare of plowland. The amount of humus on their lands has increased and the yield of grain crops has increased to 40-50 quintals per hectare. The operations to accumulate and utilize organic fertilizers have been well organized in a number of oblasts of the Ukraine, Latvia, Lithuania and Estonia. Nevertheless, in the country as a whole plowland receives 2-3 times less organic fertilizer than scientifically recommended, which in some zones results in a decrease of humus in the soil and a drop in yield. The Basic Directions set the goal of increasing the use of organic fertilizers to 1-1.2 billion tons per year. The subdivisions of Sel'khozkhimiya will be called upon to take much of this work upon itself. At the present time they have not become involved in this important work everywhere. In Stavropol'skiy Kray and Saratovskaya Oblast, for example, in early April a great deal less organic fertilizer was applied than at the same time last year.

Work with the land and concern for the constant growth of productive strength in the soil must always be priorities for the directors of enterprises, agronomists, specialists of the agrochemical service and all rural workers.

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## TILLING AND CROPPING TECHNOLOGY

### EFFECTIVENESS OF TWO-LAYERED PLOWING IN NARYNSKAYA OBLAST

Frunze SEL'SKOYE KHOZYAYSTVO KIRGIZII in Russian No 3, Mar 81 pp 21-22

[Article by B. Toktoraliyev, post-graduate student of the KirgNIIZ [Kirghiz Scientific Research Institute of Grain and Grain Products]: "The Effectiveness of Two-Layered Plowing in Narynskaya Oblast". Similar material was published in JPRS 77133/1263 of 8 Jan 81 p 47 and JPRS 77543/1269 of 10 Mar 81 p 79]

[Text] In 1980 for the first time in its history, Narynskaya Oblast produced 38.4 quintals of grain from each irrigated hectare, and gross grain yield reached 186,000 tons. During the years of the past five-year plan the largest yields were produced by the grain farmers of Kochkorskiy Rayon--an average of 40 quintals per hectare. During the last 2 years an average of 45 quintals per hectare were produced.

Undoubtedly, in the achievement of such results an important role was played by high quality farming, including all its elements and particularly the fall cultivation of the soil, toward which the kolkhozes and sovkhozes of this mountainous region are moving with assurance.

Research at the Narynsk Support Point of KirgNPOZ [Kirghiz Scientific-Production Organization on Grain] in 1975-1977 determined that fall plowing at different depths (18-20, 25-27 centimeters) increases the productivity of spring barley by 5.4-6.5 quintals per hectare in comparison to spring plowing. Moreover, a discovery was made as to the regularity of increases in yield according to the depth of plowing. Now that the effectiveness of fall plowing using regular equipment for primary cultivation with the aid of a cultivation plow (PN-4-35) was proven, another question arose. Utilizing other types of equipment for primary cultivation would it be possible to increase the productivity of grain spike crops? Our research produced positive results.

The experiments were conducted at the Narynsk Support Point of KirgNIIZ, which is typical in farming conditions to many kolkhozes and sovkhozes in the oblast. A two-layered plow of the PYa-3-35 brand manufactured by Altaysel'mash [Altay agricultural machinery association] was tested. At the same time a study was made of the effectiveness of regular plowing techniques used in the area.

The data of field research demonstrated that two-layered plowing has a number of advantages in comparison with regular plowing--it effects the complete rotation of

Table

### Effect of Regular, Deep and Layered Plowing on the Productivity of Spring Barley (1978-1980)

| Variant | Grain yield, quintals per hectare | | | Average for 3 years | Increase | |
|---|---|---|---|---|---|---|
| | 1978 | 1979 | 1980 | | Quintals per hectare | Percent |
| Regular fall plowing to a depth of 23-25 cm, control | 40.2 | 37.3 | 36.2 | 37.9 | 0.0 | 0.0 |
| Deep fall plowing to 28-30 cm | 44.2 | 41.8 | 42.4 | 42.8 | 4.9 | 12.9 |
| Two-layered fall plowing to 10 + 20 cm | 41.9 | 39.8 | 43.2 | 41.6 | 3.7 | 9.8 |
| The same to 15 + 15 cm | 49.4 | 48.0 | 44.6 | 47.3 | 9.4 | 24.8 |
| Two-layered spring plowing to 10+20 cm | 36.2 | 36.0 | 35.6 | 35.9 | -2.0 | -5.3 |
| The same to 15 + 15 cm | 38.4 | 37.1 | 36.5 | 37.3 | -0.6 | -1.6 |
| NSR 0.05 quintals per hectare | 2.5 | 1.7 | 2.0 | | | |

the furrow, better crumbling with division into two sections and the deep placement of root and stubble remains and the seed of weeds. As a result this method decreases the weed infestation of fields significantly and creates favorable conditions for the occurrence of soil processes and for the assimilation of minerals by plants. In the final analysis, it results in a better development of barley and in its increased yield.

As we can see from the data in the table, two-layered fall plowing to a depth of 30 centimeters according to the scheme 15 + 15 centimeters was the most effective in comparison to plowing with a regular plow to a depth of 23-25 and 30 centimeters and even in comparison to two-layered soil cultivation in the fall according to the scheme of 10 + 20 centimeters. The increase in the yield of spring barley comprised 9.4 quintals per hectare as compared with regular plowing to a depth of 23-25 centimeters and 4.5 quintals per hectare as compared with plowing to a depth of 30 centimeters. Two-layered fall soil cultivation using the scheme 10 + 20 centimeters is noticeably inferior to the same type of cultivation using the 15 + 15 centimeter scheme and deep fall cultivation.

The data in this table, like our research that was published in this journal previously, demonstrates that spring cultivation, whether performed using regular cultivation plows or two-layered plows, does not secure an increase in the productivity of spring spike crops that can compare to that secured by land plowed in the fall using the same equipment for primary soil cultivation. Consequently, the reasons for the differences in the effectiveness of spring and fall plowing are found not in the equipment that is used for cultivation but in specific soil processes that occur at various times of the year.

Thus, under the conditions of Narynskaya Oblast, the introduction of deep plowing to 30 centimeters in the fall and two-layered plowing to a depth of 30 centimeters according to the scheme of 15 + 15 centimeters will encourage the successful achievement of greater productivity for spring barley and of increased gross yields of grain during the new five-year plan. The oblast association of Goskomsel'khoztekhnika [State Committee of the Agricultural Equipment Association] must organize the delivery of two-layered suspension plows from the plant of Altaysel'mash.

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# IMPORTANCE OF CLOVER IN NONCHERNOZEM AREA CROP ROTATION

Moscow SEL'SKAYA ZHIZN' in Russian 18 Apr 81 p 2

[Article by M. Stikhin, doctor of agricultural sciences, professor, Leningrad Oblast: "Russian Clover"]

[Text] It is no accident that clover is called "Kashka" [colloquial term for clover among the people--for its aroma, the sweet taste of the flowers and excellent feed qualities for all types of livestock. In evaluationg the role of legumes highly, K. A. Timiryazev wrote that, "probably there have not been many discoveries in history that have been such a boon to man as the inclusion of clover in crop rotation, which so strikingly magnified the farmer's labor."

The development of clover cultivation in European countries and here had a direct effect on the quality of agriculture. The transition from variegated fields and three-field-rotation to the use of land in crop rotations with clover enabled us to double productivity. It is natural that the Basic Directions again propose an expansion and increased production of legumes, and especially of clover, alfalfa and peas.

The significance of clover is particularly great in the Nonchernozem, where it is a basic crop for various types of feed--hay, haylage, grass meal and green mass. This feed costs less to produce than others. Moreover, in comparison to hay from cereals, clover hay contains 1.5-2 times more of the irreplaceable amino acids such as lysine, arginine, leucine and others which are so important for increasing the productivity of animals. According to the tests of our institute, the output of feed units from fields of clover and timothy comprised 5,500 per hectare at a cost of 1.88 kopecks per unit. For silage crops and annual grasses the latter indicator equalled 4.5-5 kopecks. Approximately the same difference has been observed under production conditions, judging from the data of sovkhoz reports.

Clover is an important source of increased fertility of podzolic soils; when it is cultivated with high quality significant reserves of organic substances and nitrogen accumulate in the soil. Research by soil scientists has shown that when manure and mineral fertilizers are applied in a six-field crop rotation with clover the amount of nitrogen increases by 109 kilograms; in crop rotations with grasses it decreases by 346 kilograms. It is not surprising that clover is one of the best predecessors for many crops. According to our long-term data the productivity of crop rotations with clover is 36 percent greater than that with intertilled crops.

In the Nonchernozem there are many local old varieties of clover in almost all regions as a result of the fact that clover has been cultivated here for so long. In Permskaya Oblast we have Permskiy and Kungurskiy, in Yaroslavskaya Oblast--Konishchevskiy, in Gor'kovskaya--Varnavinskiy, in Kirovskaya--Malmyzhskiy and Kiznerskiy and in Moscow and Orlovskaya oblasts--Shakhovskiy and Srederusskiy. Local varieties exist almost everywhere but as long-term research and production experience have shown, they differ from imported varieties in their greater winter hardiness and productivity. At the Totemskiy Variety Plot of Vologodskaya Oblast the output of clover hay from the local Totemskiy variety reached 80-90 quintals per hectare over a period of several years; of clover seed--3-5 quintals. In tests of the All-Union Institute of Feeds the yield of clover seeds over a period of years comprised 5.5 quintals per hectare with regular sowing.

Unfortunately, only some enterprises have achieved great results in clover cultivation. The area in this valuable crop has decreased, cereals are now prevalent in stands of perennial grasses and the harvesting of clover seeds has decreased. There was a time when we exported the seed of our ancient clover to other countries, where it was valued for its winter hardiness and productivity. Today the situation has deteriorated to such an extent that in many places clover seed farming has been completely abandoned.

Why is less attention being given to this crop? There are many reasons. First of all, many directors have the faulty view that with large amounts of nitrogen fertilizer it is possible to do without clover and that livestock feed can be produced from cereal grasses. However, in a correct system the nitrogen of mineral fertilizers and the inexpensive nitrogen from legumes supplement one another! Moreover, nitrogen that is accumulated by clover and other legumes is used by subsequent crops more uniformly than nitrogen from mineral fertilizers.

Frequently a complaint is made that seed harvests are unstable, giving rise to certain difficulties. Actually, according to data from the All-Union Institute of Feeds, during favorable years the yield of seeds comprised 3-4.5 quintals per hectare, and during unfavorable years it dropped by 30-40 kilograms. But does this mean that seed farming should be totally neglected. Leading enterprises produce their own seed from year to year. Even in Leningrad Oblast, where the unfavorable conditions for the pollination of clover are more frequently observed than in the central and eastern regions of the Nonchernozem, the Leninets Sovkhoz has had its own seed, its own reserve in case of underproduction, for the last 15 years.

With the specialization of agricultural production, an attempt was made in Leningrad Oblast to organize seed-farming enterprises for clover. But because of the unstable harvests and consequently the economic difficulties due to this, the attempt met with failure. A decision was made to cultivate clover seed in almost all associations. The important thing is to create the necessary technical base for clover cultivation and to involve people who are knowledgeable in this field in this work.

Evidently, clover seed farming should be developed in all Nonchernozem regions. This should be begun with the rehabilitation of the ancient local varieties of clover, with their rapid reproduction and distribution.

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## STATUS OF WINTER CROPS IN UKRAINE REVIEWED

Kiev SIL'S'KI VISTI in Ukrainian 31 Mar 81 p 2

[Article by M. Sokorenko and D. Dymkovych, Ukrainian Scientific Research Institute of Agriculture workers, candidates of agricultural sciences: "Winter Crop Care in Polissya"]

[Text] This year's winter crops wintered satisfactorily in most of the Polissya Zone rayons. Now the farmers have an urgent task -- to take good care of the crops. First of all, wheat and rye must be top dressed with mineral fertilizer.

Winter crop top dressing is especially important under present conditions. According to data from the Ukrainian Scientific Research Institute of Agriculture nitrogen losses in light soil (too much rain-caused leaching) are two to four times greater than the average during the last eight years. Therefore, to provide wheat and rye nutrients, to accelerate sprouting and increase plant productivity not only early but also late top dressing with mineral fertilizer, especially nitrogen, will be effective.

In determining mineral fertilizer norms, the variety, predecessors and amount of fertilizer applied in the fall are considered. For winter wheat and rye varieties inclined to lodging allocated after fertilized occupied fallows, on turf-podzol and grey podzol soils, nitrogen doses should not be more than 40 kg of active substance per hectare. After corn for silage, stubble predecessors and soils underfertilized since the fall crops it is increased to 60-80 kg.

Over more fertile soil, after occupied fertilized fallows 30-40 kg per hectare are applied, and after unfertilized occupied fallows, stubble predecessors and corn for silage 40-60 kg of activated nitrogen fertilizer are used.

As soon as the soil is ready well developed crops are top dressed by the root method. According to data from our institute, root top dressing provides an opportunity to obtain 2.5 to 3 quintals of grain more than early spring top dressing.

To increase grain quality wheat is sprayed with a solution of urea or ammoniac nitrate during the heading stage -- 20-30 kg of activated nitrogen per hectare.

On a number of farms winter crops were sown too late and today these plants are poorly developed and thinned. These areas, depending on crop density, should be reseeded or overseeded. Data from scientific-research institutions and leading kolkhoz and sovkhoz experience testify to the fact that winter crops with 200-250 untillered plants per square meter should be reseeded early with barley and quickly ripening varieties of spring wheat, and in seed areas with peas. Reseeding crop norms should provide for 500-600 productive stems per square meter prior to harvesting.

In light soils this is accomplished by using regular grain disk seeders, and in heavy, muddy soil -- reconstructed seed drills with plowshares are used proposed by specialists at the Drabov agricultural research station, Sumskaya Oblast agricultural research station and others.

Crops with less than 180-200 untillered plants per square meter should be overseeded with the most appropriate spring crops which would yield a maximal grain harvest in specific farm conditions.

To preserve moisture and destroy weeds, well-developed winter crops on light soils are harrowed with medium or heavy harrows, and on heavy, muddy areas, especially during soil crust formation, with needle harrows and also with rotating hoes. This equipment is used on poorly developed crops only after good plant rooting.

In the Polissya area herbicides 2,4-D, butyl ether, and amine salt 2M-4KhP are also used against weeds. Crops are sprayed in an air temperature not less than 12-13 degrees with rod sprayers, using at least 300 liters of working solution per hectare.

In early plant vegetation renewal, good moisture supplies in the soil and the application of high doses of nitrogen fertilizer crops are subject to lodging. To avoid this wheat is treated with the TUR preparation (the dose is 4 kg activated substance per hectare), and rye is treated with Compozan (4 liters per hectare). This agricultural measure is done during plant stem elongation in sunny weather using rod sprayers or aircraft.

To prevent a shortfall of good quality grain, winter crops must be protected from pests and diseases. Specialists and farmers in kolkhozes and sovkhozes of the Sumskaya and Zhitomirskaya Oblasts especially should protect their crops from Swedish and Hessian flies, rust and root rots; in Chernigovskaya Oblast from Hessian flies, rust, root rots; Kievskaya -- Hessian flies, opomiza, root rots and rust.

To destroy Swedish and Hessian flies and opomiza during their massive flight crop edges 50-70 meters wide are sprayed with an 80 percent Chlorophos (1 kg per hectare) or with 20 percent Metaphos (1-1.2 kg per hectare). During mass plant infestation with brown rust they are sprayed with an 80 percent Zineb or 75 percent Policarbacine (5 kg per hectare). Against root rots Fundazol is used (0.6-0.8 kg per hectare). Crops are sprayed during plant stem elongation.

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